15 Cents JULY, 1910 $1.00 a year

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THE FOUNDRY

Pridmore Molding Machines

STRIPPING PLATE MACHINES
Round and Square; Single, Double and Treble Shaft; 450 Regular Sizes.

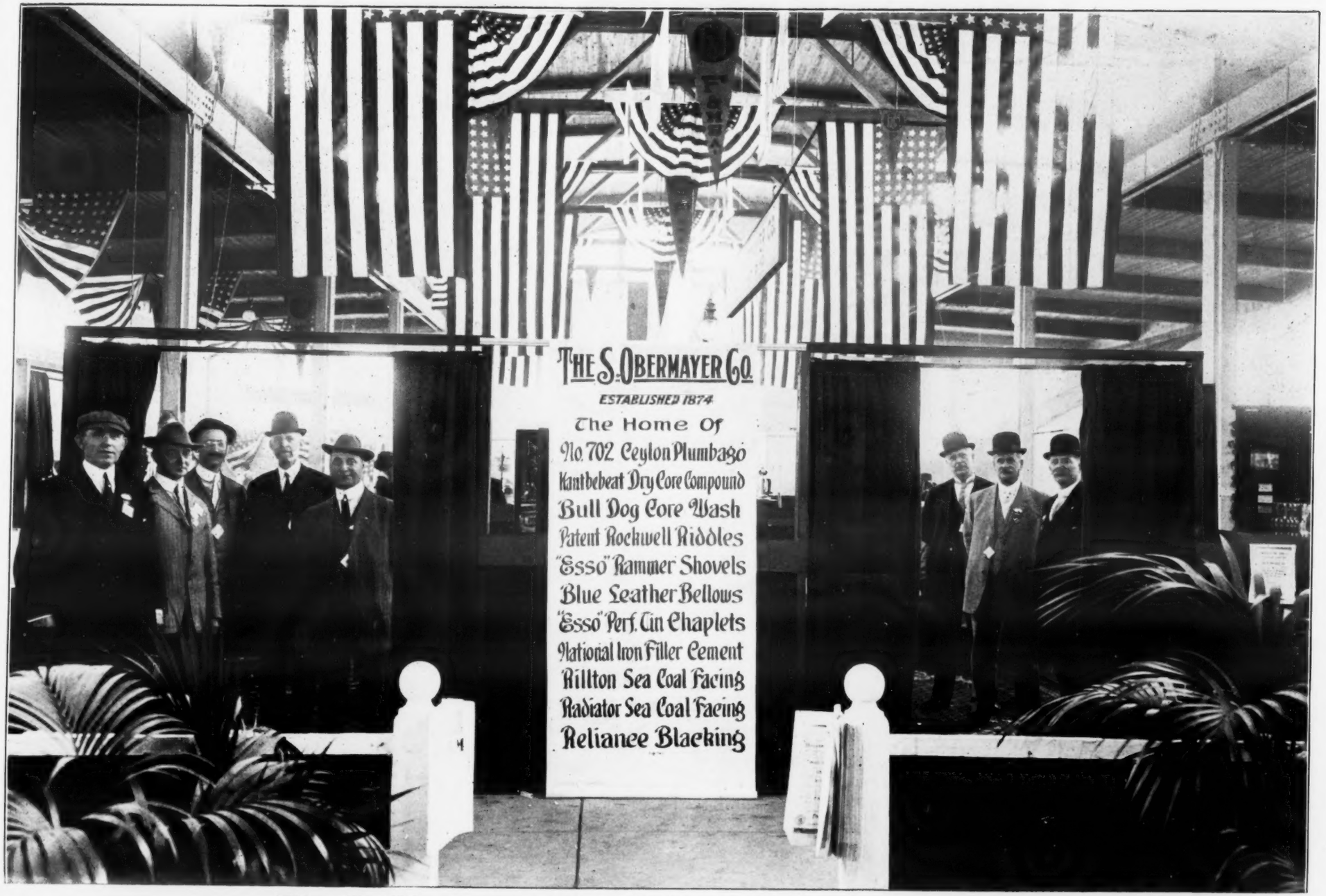
PLAIN ROCK-OVER MACHINES
fitted with adjustable self-locking flask-rests; used extensively for molding Stove Plate.

ROCK-OVER DROP MACHINES
adapted especially for Automobile Castings and for making Cores.

POWER RAMMING ROCK-OVER DROP MACHINES
for molding small castings required in very large quantities.

POWER RAMMING STRIPPING PLATE MACHINES
recently placed on the market; designed to meet the many demands that have been made for a machine combining the Power Ramming and Stripping Plate features.

Henry E. Pridmore
Chicago, Ill.



The S. Obermayer Co. at the Detroit Convention

The Spirit of Progress

That is the spirit that keeps ahead of the crowd.

A man possessed of this spirit never waits for some one else to show him the path.

If a Foundryman is going to lead, he must use leading materials.

In his Foundry, **Stevens' Pure Plumbago** (direct from India) is the leader. It is the only Lead any Foundryman can afford to use.

It leads every other Lead in its economy in use, and in its superior results.

Hand in hand with it goes Stevens' Carbon Blacking as a core wash and as a wet blacking for loam or dry sand molds.

King Kore Kompound keeps up the same satisfactory service; therein, this combination of three—this triple alliance—is always in front and leads its followers to victorious profit.

To have your Foundry run as smoothly as if on roller skates, try this combination. You can make the trial without any risk, for shipments are made on approval. It's the square, trying before buying plan.

I manufacture Foundry Facings, Foundry Supplies and Polishers' and Platers' Supplies.

FREDERIC B. STEVENS

DETROIT, MICHIGAN

FACING MILLS
Cor. Isabella Ave. and M. C. R. R.

WAREHOUSE AND OFFICES
Cor. Larned and Third Sts.

EXPORT WAREHOUSE
Windsor, Ontario

The S. Obermayer Co. at the Detroit Convention

"It's Worth While Getting SOMETHING GOOD

when you get a crane---and that ***certainly looks good.***"

A visitor at the Foundrymen's Exhibition made this remark as he viewed the Northern Type E crane handling the work under the most delicate control, and noted the novel and perfect method of securing an ***accessibly*** enclosed Foundry Crane Trolley --- something the practical foundryman has been yearning for. You should get acquainted with this crane.

NORTHERN CRANES

are certainly worth while, and "you will search in vain for a better crane."

NORTHERN ENGINEERING WORKS.
DETROIT. MICH. U.S.A.
New York, 120 Liberty St. Chicago, Monadnock Blk.
Pittsburg, Machesney Bldg.

(Our Canadian branch is the Advance Machine Works, Ltd., Walkerville, Ont.)

NEWTEN CUPOLA

The Foundrymen who are interested in ***how well a cupola is built*** as well as how well it melts evidently appreciated the good points of the Newten exhibited at the Convention. They said a lot of good things about it---those who use it say even more. Better learn about it.

NORTHERN ENGINEERING WORKS.
DETROIT. MICH. U.S.A.
Canadian Branch—Advance Machine Works, Ltd., Walkerville, Ont.)

Everything You Need In Your Foundry

Some Foundry Good Things

No. 702
Ceylon Plumbago

Kantbebeat
Dry Core Compound

Rillton
Sea Coal Facing

National
Iron Filler Cement

Esso
Perforated
Tin Chaplets

Obermayer's
Bull Dog Core Wash

Obermayer's
Rockwell Riddles

Obermayer's
Blue Leather Bellows

The S. Obermayer Co.

"Everything you need in your foundry."

CINCINNATI CHICAGO PITTSBURGH

Only The Highest Grades Manufactured

PAXSON'S QUALITY

Power Molding Machines

Giving Mechanical Description

THE Barker Type-10, pattern-drawing molding machine, shown in the accompanying illustrations, is adapted for both large and small work, and patterns on boards or match-plates can be used. Both pneumatic and hydraulic power are utilized, the former for rocking-over the pattern and the mold, and the latter for dropping the flask away from the pattern. The pattern board or match-plate is attached to the rock-over arm by bolts, this arm being pivotally mounted on standards, so that when the sand is rammed, the mold and pattern can be rocked-over onto the table, which lowers the mold away from the pattern.

In Fig. 1, the match-plate containing the pattern of a fly-wheel is shown attached to the rock-over arm. The pattern is being returned to ramming position, the mold having previously been lowered away from the pattern plate.

When ramming a mold, the rock-over arm on which the match-plate or pattern board is mounted, is in a lowered position and rests on the stops attached to the cross bar of the machine frame. The flask is then placed in position, its lugs entering recesses in the match-plate or pattern board, thereby holdign it rigidly in position. The mold is rammed by hand, and after the surplus sand has been struck-off, the bottom board is clamped to the flask. A valve is then actuated so as to allow air under pressure to enter the cylinder, which is connected to the arms carrying the pattern board or match-plate. The arm to which the mold is clamped makes a quarter turn, and after passing over the center, the mold is slowly lowered onto a vertically movable table. The air during the return movement of the piston is forced out of the cylinder through a cock, which wire-draws the air and permits the pattern and flask to settle slowly into position.

While the flask and pattern board are being rocked-over, the table is raised by operating another valve, which allows air to enter a tank, forcing the liquid into a hydraulic cylinder, thus elevating the table to a point directly underneath the over-hanging flask. On the table are levers carrying a bar, which has supports for engaging one side of the bottom board, and a projection on the table contacts with the other side of the bottom board, so that when the table is brought under the flask, the levers accommodate themselves to the bottom board. After having adjusted themselves to the bottom board, the levers are locked in position, the flask clamps are removed and the mold is lowered away from the pattern by the descending movement of the hydraulic piston. During this operation the pattern is vibrated by a pneumatic vibrator. By the operation of an air cylinder, the arm, to which is attached the pattern board or match-plate, is rocked back to its original position.

(Continued in our Bulletin.)

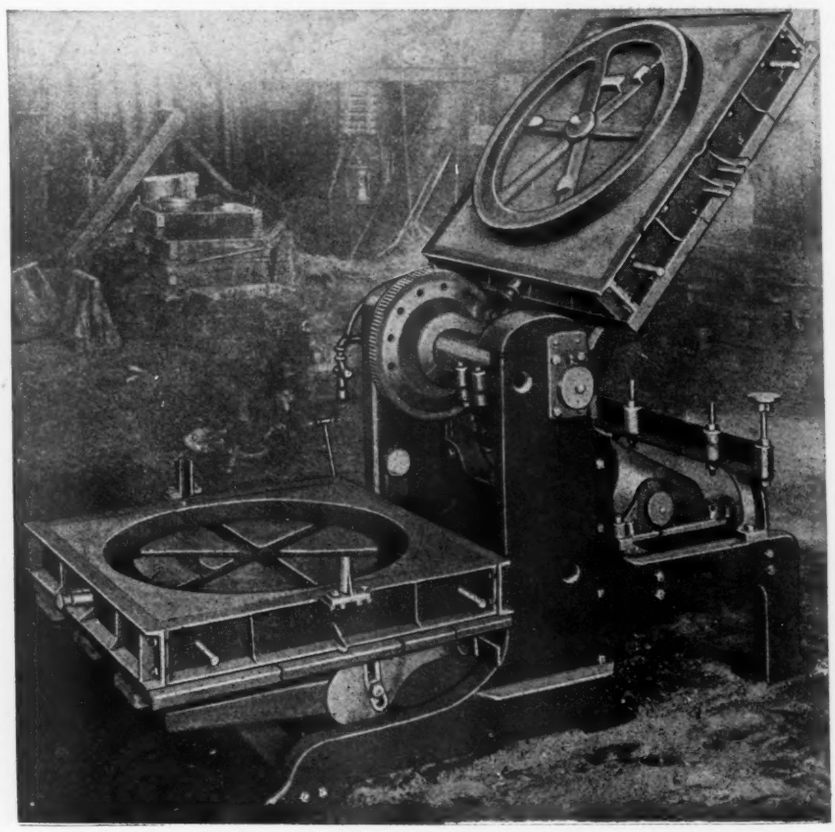


FIG. 771

FIG. 1—ROCK-OVER, PATTERN-DRAWING MOLDING MACHINE, SHOWING THE PATTERN AS IT IS BEING RETURNED TO ITS ORIGINAL RAMMING POSITION

J. W. Paxson Co.,
Philadelphia, Pa.,
BALTIMORE, MD. PROVIDENCE, R.I. TOLEDO, O.

PAXSON'S QUALITY

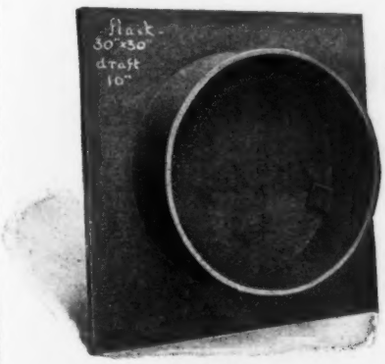


FIG. 787

Fig. 787 and Fig. 786 show general jobbing foundry practice with very deep drafted patterns mounted on a drag board.

USED ON
POWER MOLDING MACHINES

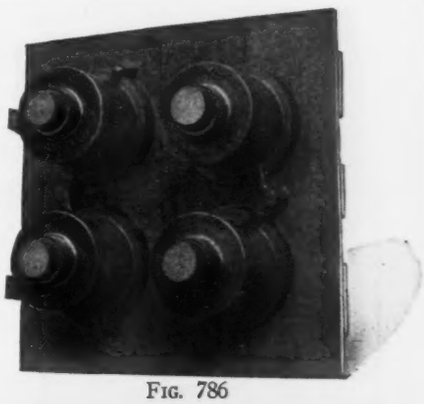


FIG. 786

FIG. 788

DRAG — COPE

Fig. 789 shows the cope made from our special preparation for hard sides, doing away with two sets of patterns.

Fig. 788 shows the drag and the pattern on Fig. 789; they are on the machine and carried out to the floor.

FIG. 789

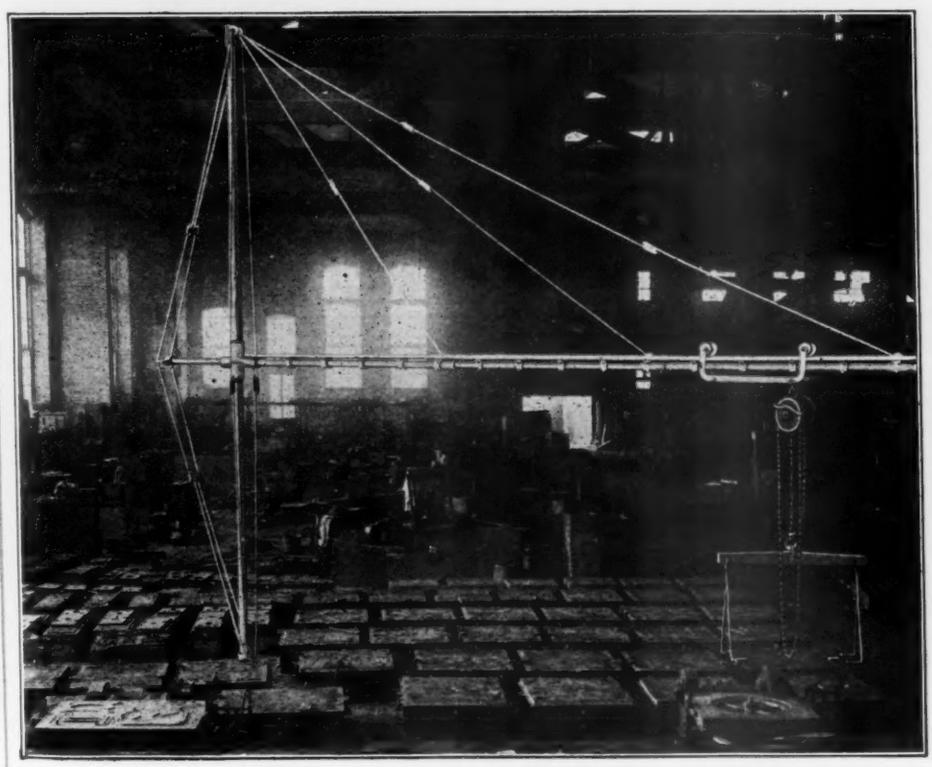


FIG. 785

CRANE

STANDARD SIZE

Mast, 20 ft. high
Arm, 21 ft. long

A crane of pipe construction. Easy moving, quick acting hoist and extra long jib, one ton cap.; removing the flasks from two Barker molding machines to the floor.

OUR OWN MAKE

For price, state height roof and length arm wanted.

J. W. Paxson Co.,
Philadelphia, Pa.,
BALTIMORE, MD. PROVIDENCE, R.I. TOLEDO, O.

PAXSON'S QUALITY

THE PAXSON-WARREN

Sand Blast Machinery

PATENTED

OVER 300 MACHINES IN DAILY USE ON ALL KINDS OF WORK

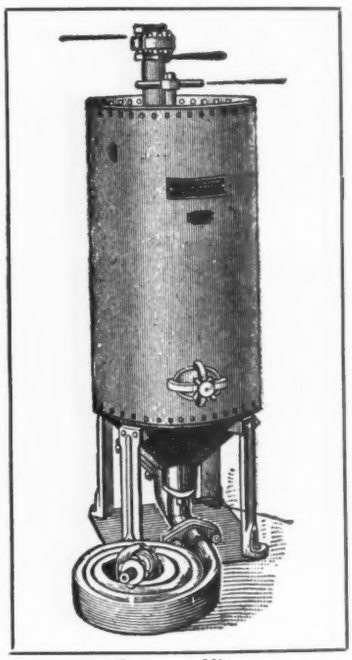


Fig. 330—Mixer

As the quickest and most economical method of cleaning steel castings, we recommend the Paxson-Warren Sand Blast Machinery.

This Sand Blast is the best designed and most substantially built Machine on the market.

It has no inside hopper. Every part is accessible, and all pieces liable to wear can be replaced. The top is coneshaped and has a valved opening for sand in the center. The valve on the bottom is for regulating the sand discharge.

To operate machine first fill with dry sand, close charging valve and turn on air, the sand falls into the air as it goes through the air pipe at the bottom of the Sand-Blast machine, amount of sand discharged being regulated by sand valve. The sand and air is conducted through a hose to the nozzle and directed against piece to be sand blasted, The face of the operator is protected by a special helmet. Can use any length hose to 50 feet. Unless otherwise specified a 12 foot length of hose, one helmet, one nozzle holder and 12 nozzles are furnished with each machine.

Sand-Blast Sand

Should be hard and tough and not too fine, thoroughly dried and allowed to cool before using so that it will not steam and clog up the machine. Care should be taken not to over-heat the sand, for this will cause it to break up and good part of its efficiency is destroyed. We are making a specialty of a hard, sharp, washed silica sand of several grades of fineness suited to different requirements. Can quote on car load lots.

The Sand-Blast Room

For medium-sized castings that two men can handle, a room twelve feet square will be amply large.

To handle large pieces, one of the best arrangements is to put track through the Sand Blast room and clean the castings on a truck.

It will be necessary in most cases to have an exhaust fan to clear the room from dust. If the Sand Blast is located near machine shops we can furnish a dry process dust collector.

Elevator System

Where a large quantity of castings are cleaned daily, our bucket elevator system is recommended to convey the used sand to either a rotary or oscillating screen where the fine particles are screened out; the coarse sand falls into a hopper, from which it is conveyed up into the sand box, where it is fed back into the Sand-Blast machine. With this arrangement only clean sand is used, consequently a great part of the dust usually resulting from the sand blast is done away with.

Sand-Blast Tumbling Barrels

For cleaning large amounts of small castings the Sand Blast Tumbling Barrel is the most up to date arrangement. The barrel is filled about one-third full, and caused to revolve very slowly, the sand-blast jet is introduced through the center of the ends of the barrel, and each piece comes in contact with the sand. One great advantage of this method over ordinary rumbling is that the sharp edges of the castings are preserved. About half an hour is required to clean one charge. The barrel itself runs inside of a casing which is connected to an exhaust fan, and dust collector if necessary.

Advantages

One man with the Sand-Blast will do more cleaning than six men with brushes, and on core work will get at places otherwise inaccessible. On castings to be machined, there is less wear on the cutting tools in the machine shop.

Compressors

We are prepared to furnish either belt or steam-driven air compressors; also air receivers.

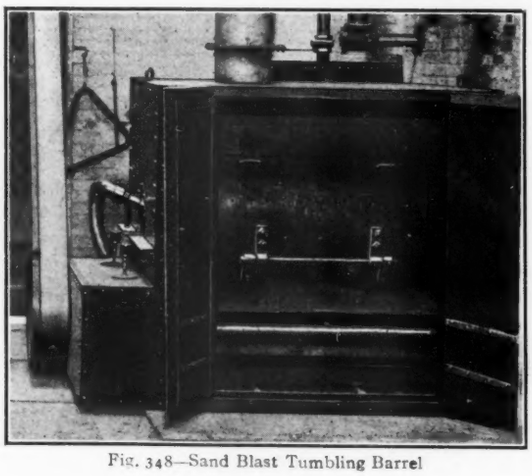


Fig. 348—Sand Blast Tumbling Barrel

J. W. Paxson Co.,

Philadelphia, Pa.,

BALTIMORE, MD. PROVIDENCE, R.I. TOLEDO, O.

PAXSON'S QUALITY

Second Hand Bargains July (1910)

We offer the following bargains, subject to prior sale; most of which have been put in first class condition in our shop. Terms Cash. Remember, we buy and sell second hand foundry equipment. (New List each month)

			NET PRICE
		GREEN BLOWERS (Positive Pressure)	
246	1	**No. ½, cap. 1½ cu. ft., 6″ outlet. (Cost $150.00)**	**$ 52.50**
247	1	**No. 1, cap. 3 cu. ft., 7″ outlet. (Cost $225.00)**	**95.00**
249	1	**No. 3 cap. 9 cu. ft., 12″ outlet. (Cost $325)**	**165.00**
255	1	No. 7-A., cap. 55 cu. ft., 25″ side outlet. (Cost $800.00)	475.00
		BAKER BLOWERS (Positive Pressure)	
260	2	**No. 1, cap. 3½ cu. ft., 6″ outlet. One with blast gate. (Cost $220.00 ea.)(ea)**	**85.00**
263	2	**No. 4, cap. 12 cu. ft., 11¾″ outlet. (Cost $425.00 ea.)(ea.)**	**200.00**
264	1	**No. 4½, cap. 16½ cu. ft., 11¾″ outlet. (Cost $450.00)**	**215.00**
264-K	1	**No. 4½, cap. 16½ cu. ft., 11¾″ outlet with 9″ x 9″ Erie engine on same bed-plate. (Cost $1,000.00)**	**425.00**
265	2	**No. 5, cap. 25 cu. ft., 15″ outlet. (Cost $500.00 ea.)(ea.)**	**300.00**
266	1	**No. 5½, cap. 30 cu. ft., 17″ outlet. (Cost $550.00)**	**350.00**
267	1	**No. 6, cap. 45 cu. ft., 21″ outlet. (Cost $675.00)**	**400.00**
269	1	**No. 7½, cap. 72 cu. ft., 24″ outlet. (Cost $1,175.00)**	**450.00**
274-I		No. 4 Acme Root Blower, 2¾″ outlet, for oil furnaces. 400 cu. in. per min. (Cost $75.00)	50.00
		ROOT'S BLOWERS (Positive Pressure)	
277	1	**No. 6, cap. 37 cu. ft., 20″ outlet. (Cost $600.00.) (Wooden impellers)**	**225.00**
		CONNERSVILLE BLOWERS (Positive Pressure)	
282	1	**—17 cu. ft. cap., 16″ outlet. (Cost $415.00)**	**225.00**
282-C	1	**—24 cu. ft. cap. 18″ outlet. (Cost $550.00)**	**375.00**
284	1	**—68 cu. ft. cap., 24″ outlet with 12″ x 12″ vertical engine on same bed-plate. (Cost $2,500.00)**	**1,250.00**
		STURTEVANT BLOWERS (Steel Pressure)	
293	2	**No. 4—7″ outlet. (Cost $50.00 ea.)**	**40.00**
294	1	**No. 5—8⅞″ outlet. (Cost $65.00)**	**52.50**
295	1	**No. 6—10″ outlet. (Cost $77.00)**	**62.50**
296	6	**No. 7—12″ outlet. One with up-blast. (Cost $130.00 ea.)(ea.)**	**92.50**
296-A	1	**Counter-shaft for No. 7 Sturtevant Blower. (Cost $42.50)**	**25.00**
297	1	**No. 8—13⅞″ outlet. (Cost $165.00)**	**115.00**
298	1	**No. 9—16″ outlet. (Cost $227.50 ea.)...(ea.)**	**117.50**
298-A	1	**No. 9—16″ outlet on adjustable bed and C. S. (Cost $450.00)**	**175.00**
		BUFFALO BLOWERS (Steel Pressure)	
305-F	1	**No. 8—8¾″ outlet and C. S. (Cost $75.00)**	**43.50**
306-F	1	**No. 9—10″ outlet on adjustable bed-plate and C. S. (Cost $125.00)**	**95.00**
307-K	1	**No. 10—12″ outlet with vertical engine 6″ x 5″ on same bed-plate, also C. S. (Cost $475.00)**	**250.00**
		CHAMPION BLOWERS (Steel Pressure)	
309-I		No. 3—4¾″ outlet. (Cost $23.00)	15.00
310-I		No. 4—5¼″ outlet. (Cost $29.00)	20.00
		LADLES	
331-F	3	**—250 lb. cap. Bull Ladles, Fig. 126. (Cost $6.50 ea.)(ea.)**	**4.50**
331-K	2	**—400 lb. cap. Crane Ladles, c. i. basin shape bowls. (Cost $13.00 ea.)(ea.)**	**6.50**
333-B	1	**1,500 lb. cap. Crane Ladle No. 128. (Cost**	
338	2	8,000 lb. cap. Geared Crane Ladle. (Cost $120)	90.00
340-D	1	**—16,000 lb. Pin Spur Geared Ladle, "Whiting". (Cost $200.00)**	**120.00**
343	1	—2,800 lb. cap. Geared Buggy Ladle, top 31″, deep 22½″, wheels 12″, gauge 22″. (Cost $85.00)	45.00
		CUPOLAS	
344-B	1	Paxson-Colliau Cupola, 54¼″ shell. (Cost $375.00)	200.00
344-D	1	**Colliau Cupola, 63″ shell, 45 ft. high. (Cost $450.00.) (At Boston, Mass.)**	**175.00**
344-G	1	No. 4 Whiting Cupola. 56″ shell	225.00
344-N	1	Newten cupola, 42″ shell	200.00
347	2	2-ton Steel Converters and (2) extra bottoms, etc.	2,000.00

			NET PRICE
		BRASS MELTING FURNACES	
348-D	1	**No. 60 Steele-Harvey (crucible oil melting). (Cost $325.00)**	**225.00**
348-G	1	**No. 275 Steele-Harvey (crucible oil melting). (Cost $425)**	**310.00**
348-K	1	Rockwell double chamber No. 2. Cap. 500 lb. per heat, each chamber. (Cost $950.00.) (At Jersey City, N. J.)	500.00
350-D	5	**Whiting forced draft, 32″ diameter, 38″ deep, for No. 250 pot. (Cost $50.00 ea.)(ea.)**	**25.00**
350-G		**Statuary Bronze Foundry, near Boston. Complete equipment with (4) 150 pot furnaces, crane, etc. (Cost $800.00)**	**235.00**
		CRANES	
356-G	1	—7 ton Wooden Jib Crane, complete, with hoisting drum, chains, etc. Mast 22′. Jib 21′ (Cost $500.00)	175.00
356-L	1	—10 ton Wooden Jib Crane, complete, with hoisting drum, chains, etc. Mast 18 6″. Jib 28′. (Cost $600.00)	185.00
		TUMBLING BARRELS	
358	1	**Rumbler C. I. (Cinder Mill 36″ x 48″). Good as new. (Cost $175.00)**	**125.00**
359	1	**Tumbling Barrel, steel plate, exhaust, never used. 30″ diameter x 48″ long. (Cost $200)**	**150.00**
		SEPARATORS	
360-A	1	Small Hill Ashes Grinder and Separator. (Cost $120.00)	50.00
360-F	1	**Barnard & Leas Magnetic Separator. (Cost $300.00)**	**162.50**
		AIR COMPRESSORS	
361-A	1	**Air Compressor, "Blaisdell," 12″ x 8″, belt driven, cap. 150 cu. ft., 20 to 30 lb. pres., 150 R. P. M., used slightly. (Cost $440.00)**	**287.50**
		MOLDING MACHINES	
363	4	**McKenna Molding Machines with Flasks, for Plumbers' Brass Work. (Cost $125.00 ea.)(ea.)**	**65.00**
363-D	2	**Berkshire Molding Machines (automatic). Floor space 9 ft. 4″ and 6 ft. 5″. One cost $1,200.00**	**550.00**
		Other cost $1,200.00 (little used)	**700.00**
363-F		12-30″ Adams "Farwell" Squeezers, at Newark, N. J. (Cost $45.00 ea.)(ea.)	23.50
		FLASKS	
365		Lot Snap Flasks, Beveled Iron Flasks, Flask Boards, etc.	
		MISCELLANEOUS	
368	3	**Hay Rope Twisters, "RIEHLE." (Cost $230.00 ea.)(ea.)**	**120.00**
368-A	1	—Iron Foundry Plant, 5-ton cap., ready to run with cupola, elevator, blower, traveling crane, dynamo, flasks, etc., at Wilmington, Del. (Cost $7,000.00)	3,600.00
368-K	2	**Steel Oil Tanks, 6 ft. x 25 ft. out of ¼″ plates. Cap. 5,000 gallons—dished heads—manhole—inlet and outlet. (Cost $425.00 ea.)(ea.)**	**250.00**
368-N		**1,000 lbs. 26.76 per cent Ferro-Silicon (lump). (Cost 3c per lb.)**	**.02½c**
368-P	5	**tons Danish Pebbles (assorted) for use in Rumblers and Flint Mills. (Cost $25.00 per ton)(per ton)**	**17.50**
368-Q		30 "Whiting" foundry trucks, 2-ton cap. Channel iron frames—wooden platform 30″ x 54″ with steel posts, wheels 10″—new. (Cost $40.00 ea.)(ea.)	30.00
368-R		**2—Skeleton Core Trucks, 4 wheels. 20″ wide, 6½′ long. (Cost $40.00 ea.)(ea.)**	**15.00**
368-S	1	**Drying Stove, C. I., for Brass Foundry. Good as new. (Cost $25.00)**	**19.00**
368-W	1	**Adams Milling Head to atta. to planer for hogging. (Cost $250.00)**	**150.00**
369		**Lot "Harrington" and "Box" chain hoists, 2, 3, 4, 6 and 8-ton cap.**	

J. W. Paxson Co.,
Philadelphia, Pa.,
BALTIMORE, MD. PROVIDENCE, R.I. TOLEDO, O.

Gentlemen, Gentlemen!

ATTENTION!

If you wish the **best castings**---if you wish the **best all-around results**---if you wish the **biggest profits**---you must use the

Best Foundry Sands

Whitehead Foundry Sands

have been supreme for over fifty years. For more than half a century we have been mining and shipping sand from our own banks, and have always furnished the **highest quality, promptly at the right price.** We **guarantee** our sands to be all that we claim.

We will also be glad to supply you with Fire Clay, Kaolin, Dry and Liquid Core Compounds, Plumbago and General Foundry Supplies.

ALL ORDERS WILL RECEIVE PROMPT ATTENTION—WRITE

WHITEHEAD BROTHERS CO.

PROVIDENCE NEW YORK BUFFALO

"The Guaranteed Kind"

FACINGS SUPPLIES & EQUIPMENT

Ask for Catalog No. 6

Foundry Necessities

Hill's Ebony Core Compound.
No. 118 East India Plumbago.
Haskins' Patent Ventilated Chaplets.
Peerless Perforated Chaplets.
Ideal Core Wash.
Faultless Parting Compound.
Wax Wire Core Vents.

WE CARRY GLUTRIN IN STOCK.

THE HILL & GRIFFITH COMPANY
CINCINNATI, OHIO BIRMINGHAM, ALABAMA

Will You Answer T

How many pieces of machinery do you operate?

How many of the operations in the making of your output are done by machines?

Why have you adopted these machines?

How many operations do you still perform by hand that could be successfully performed by machines?

The old methods—*antiquated you might call them now*—are practically all hand work.

Today you do as little work as possible by hand.

If you use molding machines *you know why*—
If you use core machines *you know why*—
If you use core wire machines *you know why*—
If you use sand riddling machines *you know why*—

And in your cleaning room—how much hand work is done there to-day? In other words, do you clean by high pressure Sand-Blast? And if not—why not?

We ask these questions that you will answer them to yourself—not to us.

The man who adopts machinery to replace hand work and does it quickly when a competent machine is made, makes nearly all the difference in profit.

Competition eventually brings prices down to somewhere near bed rock, when the machine has been generally adopted, but the rapidity with which new, labor-saving, devices are invented these days mean that your lifetime and ours will be filled with opportunities to keep ahead of slower moving competition. In other words, **the live man in every walk of business life is still making money with his brains.**

We are devoted to Sand-Blasting by high pressure. It is the one problem which occupies our minds from sunrise to sunset—and often later.

We have made a business of it—a great, big business—

This to Yourself

it is not a side line—and it is safe for you to presume that we are better acquainted with every detail of cleaning costs and possible savings in the cleaning room than any other set of men on the face of the earth.

We have proven by the most careful investigations, and oodles of time spent in figuring and observation of every conceivable kind of foundry work, that there is hardly a foundry which could not install a sand blast system without making money almost immediately.

In other words, sand blasting pays for the equipment quickly and in cases of close competition on large orders **often gets the business** because you can figure close to the cushion on cleaning.

Many foundries still clean by old methods. There is still opportunity for you to hustle your competition with **cleaning savings** or put the wages of two, three or four men into your own pocket every Saturday evening.

We have said very little about the Pangborn High Pressure Sand-Blast System, because, it is first necessary that you should become interested in the facts that pertain to this highly efficient and labor-saving method of cleaning. As the **Pangborn** System is the **Standard** equipment of today, it will command your attention if you will simply make up your mind that you want to know whether there is a chance in **your foundry to save some of the present expense.**

We will let you talk with one of our salesmen, all of whom are *foundrymen by trade* and *experts on cleaning*, if you will simply signify the desire to learn what we know about cleaning. It won't cost you a cent and you won't be importuned to buy a Pangborn High Pressure Sand-Blast System. We will simply talk with you about your own conditions and what *we think* you can accomplish with Sand-Blast. Then you can do some tall **thinking for yourself.**

The way to get some of the facts in hand is to drop us a line today.

THOMAS W. **PANGBORN** COMPANY

NEW YORK

GENERAL OFFICES, 87 WEST STREET

133

Remember Kelly Facings

GUARANTEE CLEAN CASTINGS

"Dunn Patent Molders' Bellows"

Will blow more wind than any other bellows on the market. It is more durably constructed. The hinge and spout is of malleable iron. Dunn bellows satisfy the shop wherever used. Send us a trial order. If they don't prove to be the best bellows you ever used you can return them at our expense

"KELLY" Goods Guarantee Satisfaction

THEY NEVER FAIL

T. P. Kelly & Co.

MANUFACTURERS OF

Foundry Facings and Supplies

Imported and Domestic Graphite

Glutrin carried in stock

CHICAGO
18th & Sangamon Sts.

NEW YORK
544-546 West 22d St.

HAMILTON
Ohio

FOR THE FOUNDRY

FEDERAL VENTLESS FACING

Sold on absolute guarantee.

Just think—we guarantee one ton of our Ventless Facing to go as far as three tons of seacoal, and to eliminate 50% of the work required in venting moulds. Where regular seacoal facing is used at the ratio of 1 to 8, Ventless Facing is used 1 to 24. Our Ventless Facing costs twice as much as Seacoal, but remember that we guarantee it to go three times as far. This means a saving of one-third, 33⅓%.

IT IS CHEAP—TRY A SAMPLE TON.

BRIGHT'S DRY CORE BINDER

Made in six grades.

No. 1 grade for ordinary grey iron work.

No. 2 grade for grey iron, brass, malleable and steel.

No. 3 grade is stronger, will bind more sand than No. 2 and is used for the same class of work.

No. 4 and No. 5 grades are very strong, and you can make with them many cores that you are now making with rosin and oil.

No. 6 grade is made expressly for car wheels.

FEDERAL 2 IN 1 STOVE FACING

Takes the place of both the heavy and return facing. In other words, it is a One Bag Facing. Makes a perfect print, absolutely no sticking to the pattern, nor will it cut or wash. The sand peels very easily, leaving a smooth surface, and a rich, dark color. The kind that is sought after by all stove manufacturers. It is ground and bolted to a palpable powder. This means no shakings left in the bag. It is also a good Parting.

Sample barrel sent on approval.

FEDERAL BLACKING

For Loam, Dry Sand Molds and Cores.

If you want something a little better than what you have been using, just try a sample barrel. Cheap at $25.00 per ton.

THE FEDERAL FOUNDRY SUPPLY CO.

CLEVELAND WORKS
2639 East 79th St.

PITTSBURG OFFICE
400 Grant St.

MILWAUKEE WAREHOUSE
285 Oregon St.

CORE OVENS

"SMITH"

"The Big Hit at the Detroit Convention"

GAS, OIL, COKE OR COAL FIRED

These ovens built for The Ferro Machine & Foundry Co., Cleveland. We made a complete installation of 24 ovens in this plant.

Send for booklet describing this installation

Greatest Core Oven Builders in the World

We sell Glutrin.

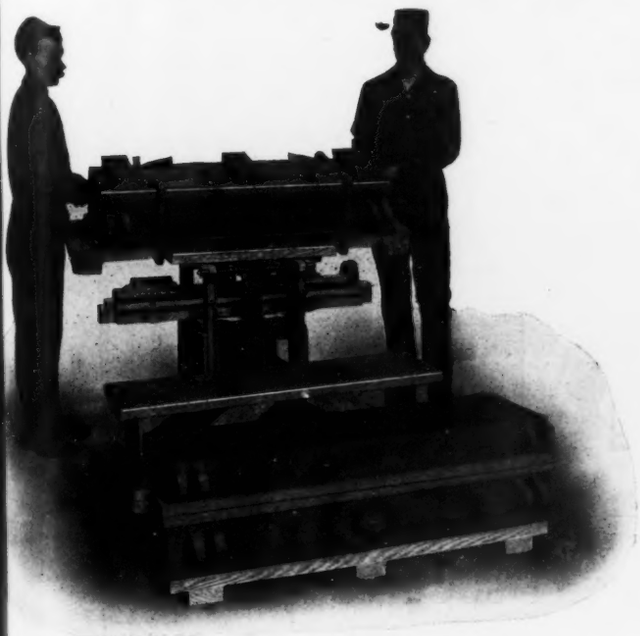
We also build Brass Furnaces with the cover that swings, Sand Blast Outfits, Sprue Cutters, Molding Machines, Squeezers, Water Tumblers, Cranes, Trolleys, Hoists, Cars, Turntables and Grinders. Send for special bulletins.

We also make Foundry Facings and Plumbago.

THE J. D. SMITH FOUNDRY SUPPLY CO.

Foundry Engineers **Cleveland, O.**

CLEVELAND
Drop Plate and Stripping Plate MOLDING MACHINE



Cut Shows Roll-Over Attachment with Drop Plate and Stripping Plate Combined

Class A Standard

A 12—Flask widths, 8", 9", 10", 11", 12".
Pattern lengths, anything up to 36" inclusive.
Drop 6" or less. ←
65 sizes of flasks.

A 16—Flask widths, 12", 13", 14", 15", 16".
Pattern lengths, anything up to 48" inclusive.
Drop 10" or less. ←
85 sizes of flasks.

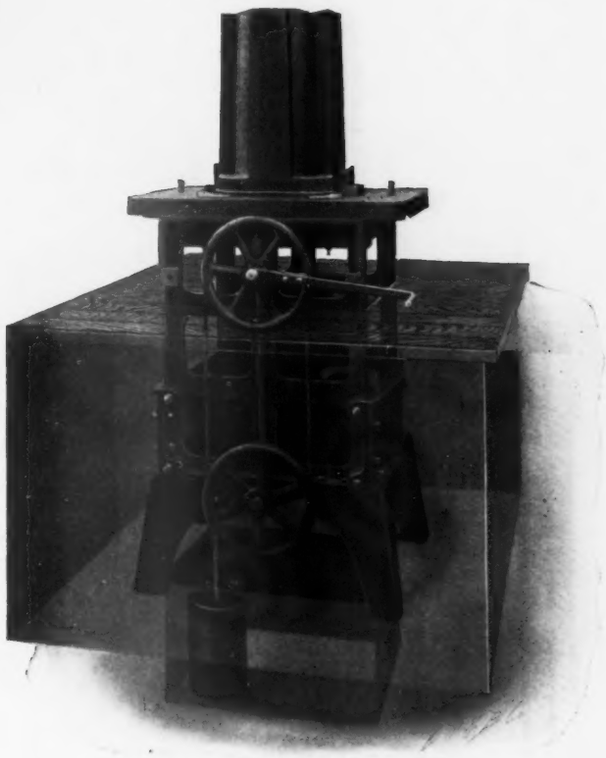
A 20—Flask widths, 16", 17", 18", 19", 20".
Pattern lengths, anything up to 60" inclusive.
Drop 8" or less. ←
105 sizes of flasks.

A 24—Flask widths, 20", 21", 22" 23", 24".
Pattern lengths, anything up to 72".
Drop 8" or less. ←
125 sizes of flasks.

Class B Standard

B 20—Flask widths, 16", 17", 18", 19", 20".
Pattern lengths, anything up to 60" inclusive.
Drop 16" or less. ←

B 24—Flask widths, 20", 21", 22", 23", 24".
Pattern lengths, anything up to 72" inclusive.
Drop 16" or less. ←



A MARVEL OF SIMPLICITY
In Molding Machine Design

Send for Bulletin I-R-2.

THE J. D. SMITH FOUNDRY SUPPLY CO.
Foundry Engineers **Cleveland, O.**

FOR DRY SAND AND CORE WORK USE

Vulcan and Ajax BLACKING

has been used with GREAT SUCCESS FOR YEARS.

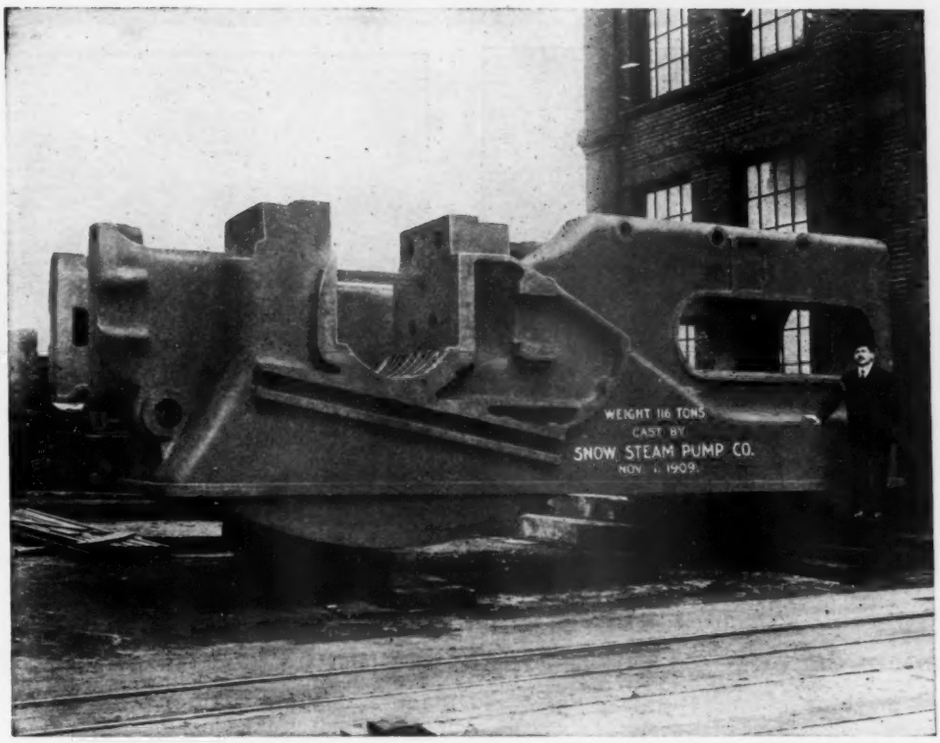
It is **absolutely** RELIABLE and UNIFORM, and makes a hard skin that will not wash, cut or buckle. It leaves the Casting a natural color.

We also make Blackings for Rolls, Ingot Molds, Cast Iron Pipe, etc., together with many grades of Plumbago, Soapstone and the best grade of Sea Coal made from Youghiogheny Coal.

We carry a full line of Foundry Equipment and Supplies, such as Cupolas, Ladles, Blowers, Tumbling Barrels, etc.

— Give us a Trial —

J. S. McCORMICK CO.
PITTSBURGH, PA.



Columbian Dry Sand and Loam Facing Did It

The above is a picture of a 232,000 lb. casting and is the best proof of the perfect results obtained by using this facing. It is the greatest heat-resisting blacking known to the grey iron founders' world.

COLUMBIAN STOVE PLATE FACINGS

Made in five grades, of Heavy Stove Plate and Return Facing

COLUMBIAN No. 1 CORE OIL

This oil is equal to linseed at a considerable less cost. Trial barrel strictly on approval.

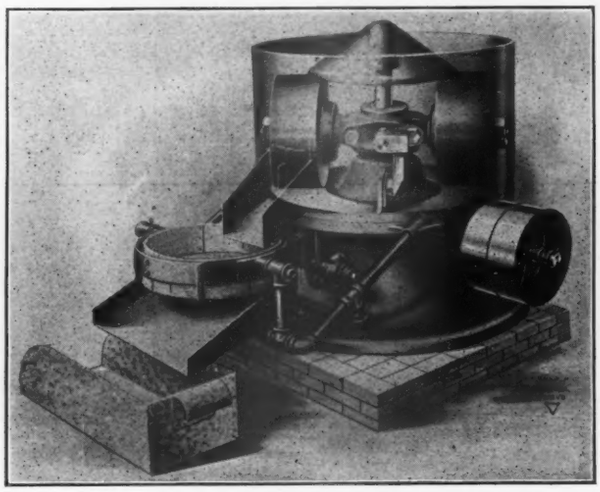
COLUMBIAN DRY CORE COMPOUND

Successfully used by foundries making the largest and most difficult core work, and guaranteed to be the cheapest corebinder on the market, all things considered.

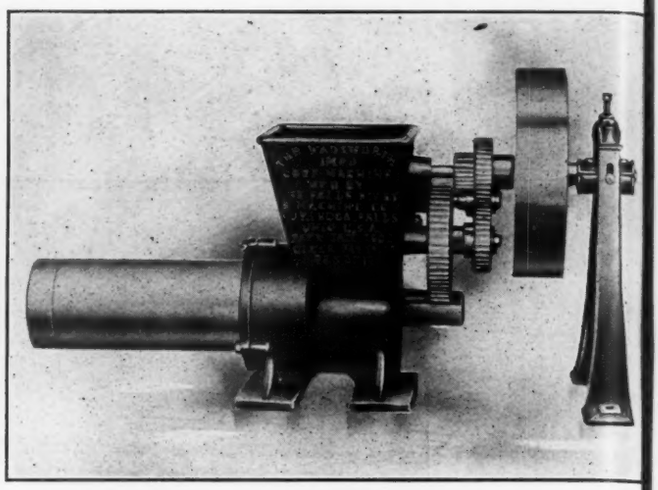
WE MANUFACTURE EVERYTHING IN FOUNDRY FACINGS AND SELL EVERYTHING IN THE FOUNDRY SUPPLY LINE

BUFFALO FOUNDRY SUPPLY CO.

337 TO 349 BABCOCK ST. BUFFALO, N. Y.



The Wadsworth Sand Mixer and Compounder



The Wadsworth No. 3 Core Making Machine, 3-8 to 7 in.

THE WADSWORTH

Improved Core Making Machines and Core Room Equipment

The only core machine manufacturer in the world manufacturing a complete line of core room equipment and makes a stock core into a standard core.

The only Core Machine manufactured that makes a rodded core. Patent applied for.

Sand Mixers and Compounding Mills
Core Making Machines
Core Ovens
Core Cutting-off Machines
Rumbling Barrels
Gagger Molds

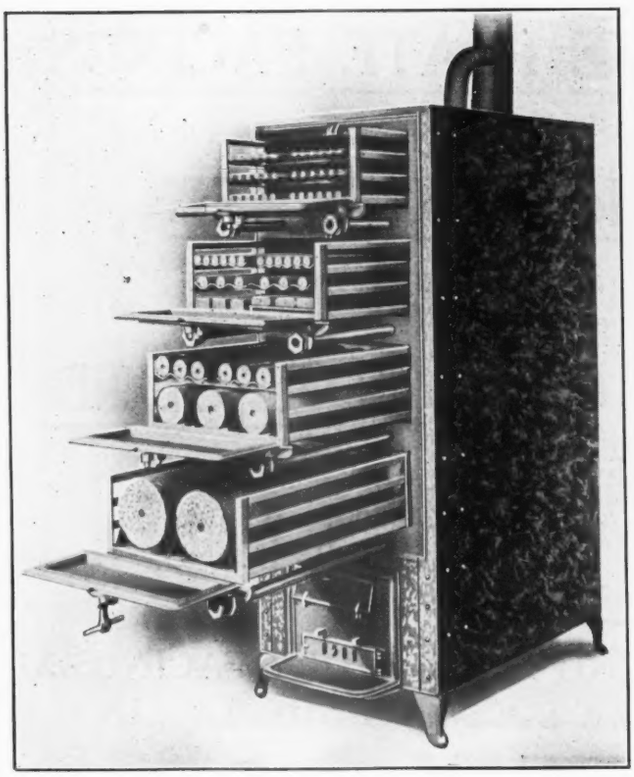
Manufactured by

The Falls Rivet & Machine Company

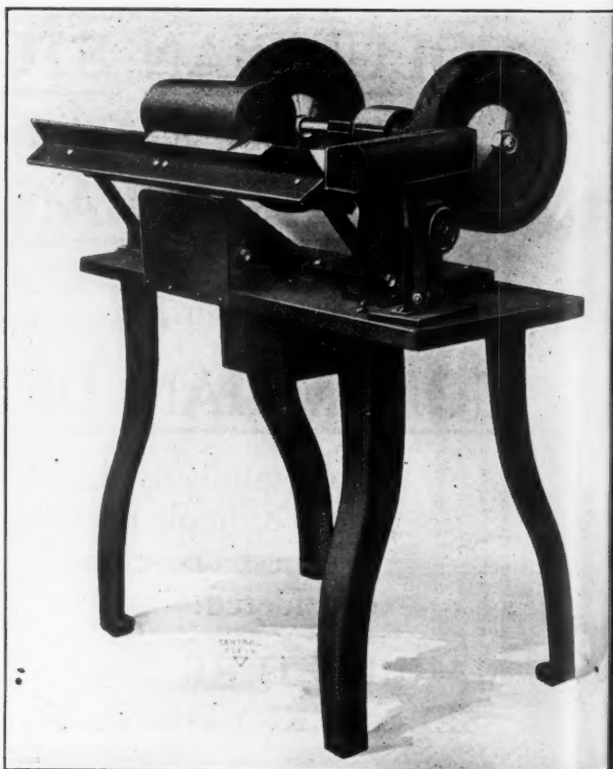
Engineers, Machinists and Founders

Cuyahoga Falls, Ohio, U. S. A.

The Wadsworth Core Oven



The Wadsworth Core Cutting-off and Coning Machine



—Foreign Agents—

J. W. JACKMAN & CO., LTD., Caxton House, London, S. W.

THE HAMILTON FACING MILL CO. LTD., Hamilton, Ont., and Montreal, Q

THE ONLY STANDARD CORE MACHINE IN THE WORLD

Group of Wadsworth Vertical Jar Ramming Core Forming Machines

Makes cores to exact length coned on one or both ends. Chambered cores or cores of irregular shapes and vented end to end can be used with regular heap sand: no special preparation of sand necessary.

Manufactured by

THE FALLS RIVET & MACHINE COMPANY

Engineers, Machinists and Founders

Cuyahoga Falls, Ohio, U. S. A.

Foreign Agents

W. JACKMAN & Co. LTD. Caxton House, London S. W.

THE HAMILTON FACING MILL CO. LTD., Hamilton, Ont., and Montreal, Que.

PETTINOS MOLDING SAND

ALBANY
NORTH RIVER
LUMBERTON
SILICA
JERSEY

FIRE SAND
BLAST SAND
MILLVILLE GRAVEL
JERSEY GRAVEL

Shipment by water or rail.
The kind you want and when you want it.

PETTINOS PLUMBAGO

The kind you will eventually buy.

PETTINOS CORE COMPOUND

The kind that is just a little better than "the others."

AND

Sand, Plumbago and Compound
the cheapest on the market for

RESULTS.

Glutrin in Stock.

NEW YORK **BETHLEHEM, PA.** **PHILADELPHIA**

VANADIUM

raises

Foundry

Quality,

Profits,

and

Resources

added to molten iron or steel ***in the ladle*** combines with the oxygen and nitrogen present and carries away these impurities in a fusible slag. Its scavenging action produces a clean, dense, non-porous and homogeneous metal of increased tensile strength.

Foundries that formerly lost more than half their product in the final test after machining now get 90 per cent yield of finished gas engine cylinders by adding ferro-vanadium in the ladle. Ferro-vanadium is not a finishing compound to patch up visible defects: It is a metallic strengthener that goes into every molecule of the melted metal, making it solid and healthy. It has all the advantages of other high grade alloys and none of their defects. It is used in very small quantities:—for castings, about one-tenth of one per cent of Vanadium gives remarkable results.

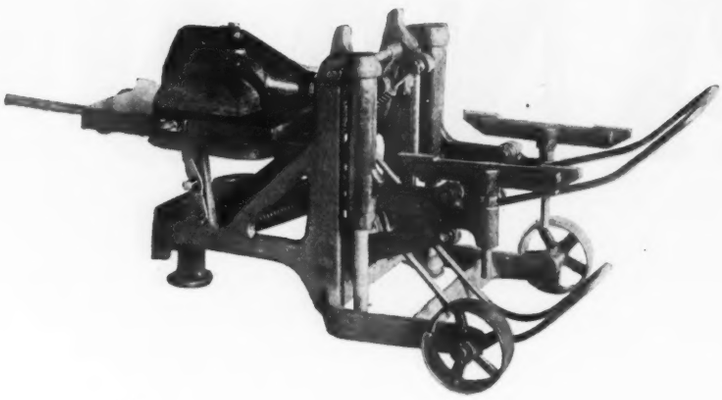
Vanadium Castings resist the influence of continued high temperatures; don't crystallize; they wear under sliding friction to a mirror surface. They have more strength and four times as much life as ordinary iron castings. They machine readily and stand high pressures.

Vanadium raises profits in two directions: By cutting down the percentage of bad castings almost to zero, and by enabling the founder to supply the highest grade trade at better prices. For gas engine cylinders Vanadium is absolutely essential; it is peculiarly suitable for this work; it was Vanadium that made the success of imported Automobile engine cylinders.

Vanadium enlarges the resources of a foundry. Being added in the ladle and not in the cupola, you can pour from the same heat, anything desired. You can control the contents of Vanadium from nothing to the maximum, with perfect certainty. You need no special equipment, no new patterns or machinery. Full information and booklets on request.

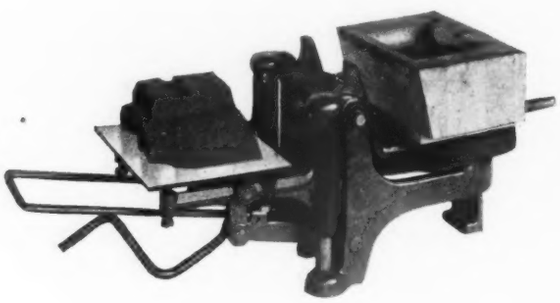
American Vanadium Company

320 Frick Building **PITTSBURGH, PA.**



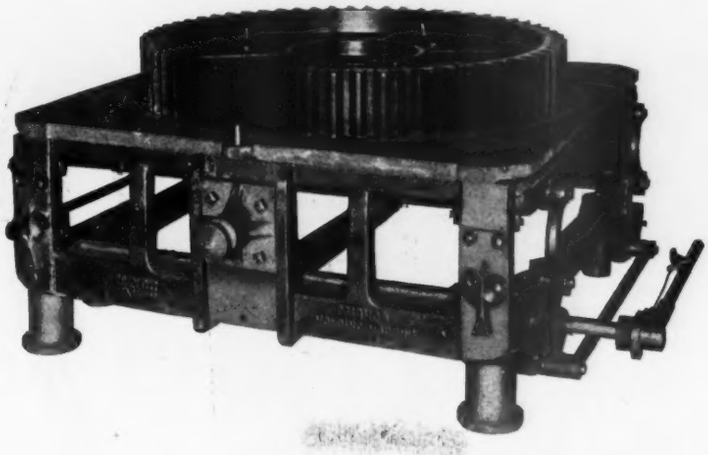
PRIDMORE MOLDING MACHINES are now used for molding the castings for over 80% of the Automobiles that are being made in this country. The above illustration shows the type of machine which such concerns as Buick Motor Co., the Cadillac Motor Car Co., The Dayton Motor Car Co., The E.-M.-F. Co., The Ford Motor Co., The Packard Motor Car Co., etc., etc., are ordering — sometimes in lots of six and a dozen at a time. Cylinders, Fly Wheels, Pistons, Crank Cases, Housings, Valve Chambers, Mufflers, Gear Case Covers, Carburetors — in fact every casting used in the construction of the Automobile can be produced on the PRIDMORE machine at a saving of from 50% to 90% over former molding costs.

THE PRIDMORE CORE MOLDING MACHINE was introduced to the trade at the recent A. F. A. Convention. One or more of these machines was ordered by almost every foundryman in attendance that makes cores in sufficiently large quantities to warrant the use of a machine of its capacity.



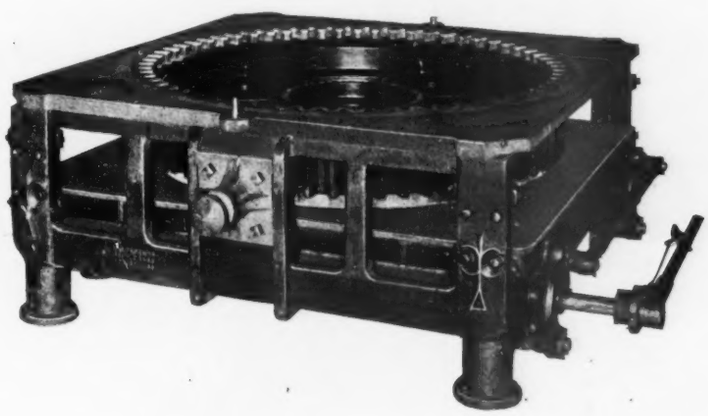
Henry E. Pridmore

Chicago, Illinois



PRIDMORE STRIPPING PLATE MOLDING MACHINES are made in seventeen different designs and four hundred fifty sizes, ranging in the Square type from 7″ x 12″ up to 58″ x 90″ and in the Round type from 10″ diameter up to 64″ diameter. The International Harvester Co. is using about two thousand of them; the General Electric Co., International Steam Pump Co., Brown & Sharpe Mfg. Co., American Brake Shoe & Foundry Co., Crane Co., Dodge Manufacturing Co., American Radiator Co., New York Air Brake Co., etc., etc., have had their foundries equipped with them for many years.

The machine shown measures 52″ square and has 8″ pattern draft. By hand a molder and a laborer made three of these gears for a day's work; on the machine they are making seven.



Henry E. Pridmore

Chicago, Illinois

Tabor Molding Machines

Are Endorsed By

The Foundry World's Highest Tribunal

who

AWARD

to

The Tabor Manufacturing Co. of Philadelphia

THE PENTON SILVER CUP

For the best operating exhibit at the American Foundrymen's Convention at Detroit

TABOR SHOCKLESS

VENI, VIDI, VICI

JARRING MACHINE

Acknowledged by the most competent judges

"A Revolution in Jarring Machines"

It is obvious that a machine possessing such superior and distinctive mechanical features, both in construction and operation, must necessarily become indispensable to all foundrymen who are progressive enough to have superseded artisan methods with mechanical methods.

The volume of business booked, before and during the Detroit Convention, for these machines, from small to large capacities, offers the most convincing argument that the TABOR SHOCKLESS JARRING MACHINE is destined to become the "recognized standard" for jarring machines.

Can you afford to experiment when this machine is endorsed by the most competent judges in foundry practice?

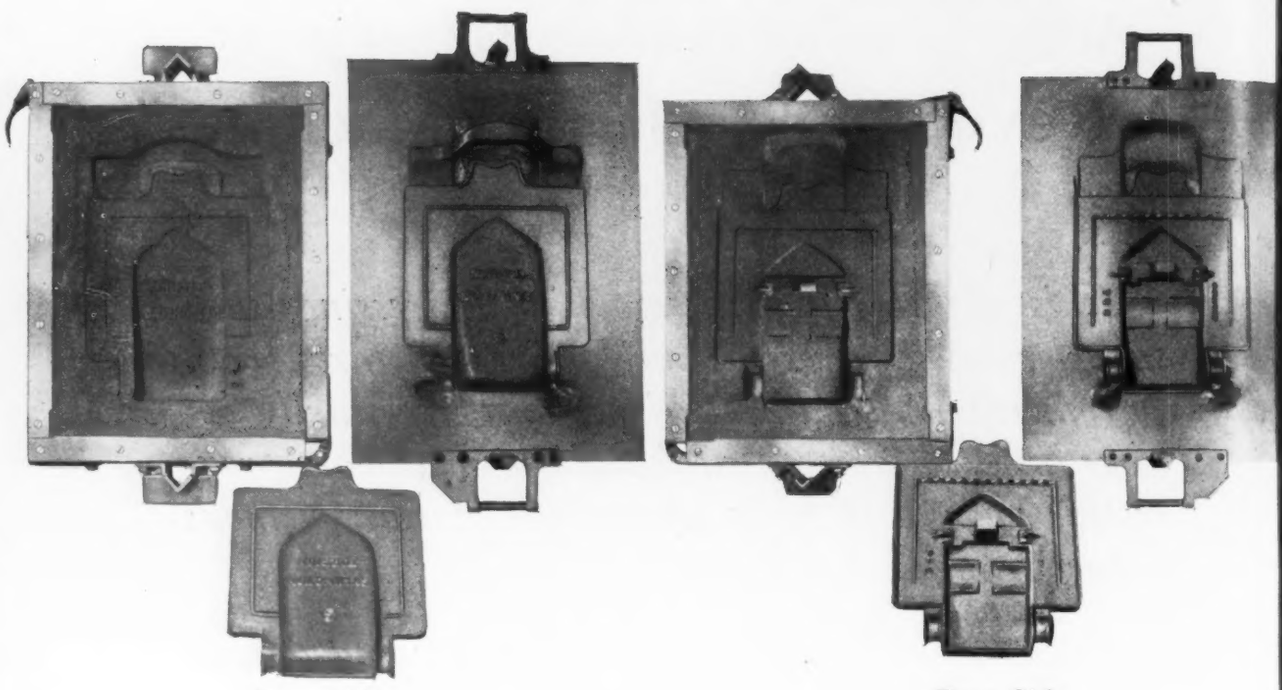
THE TABOR MFG. CO.

18th and Hamilton Sts. PHILADELPHIA, PA.

Fenwick Freres
Paris

John MacDonald & Son
Mary Hill, Glasgow, Scotland

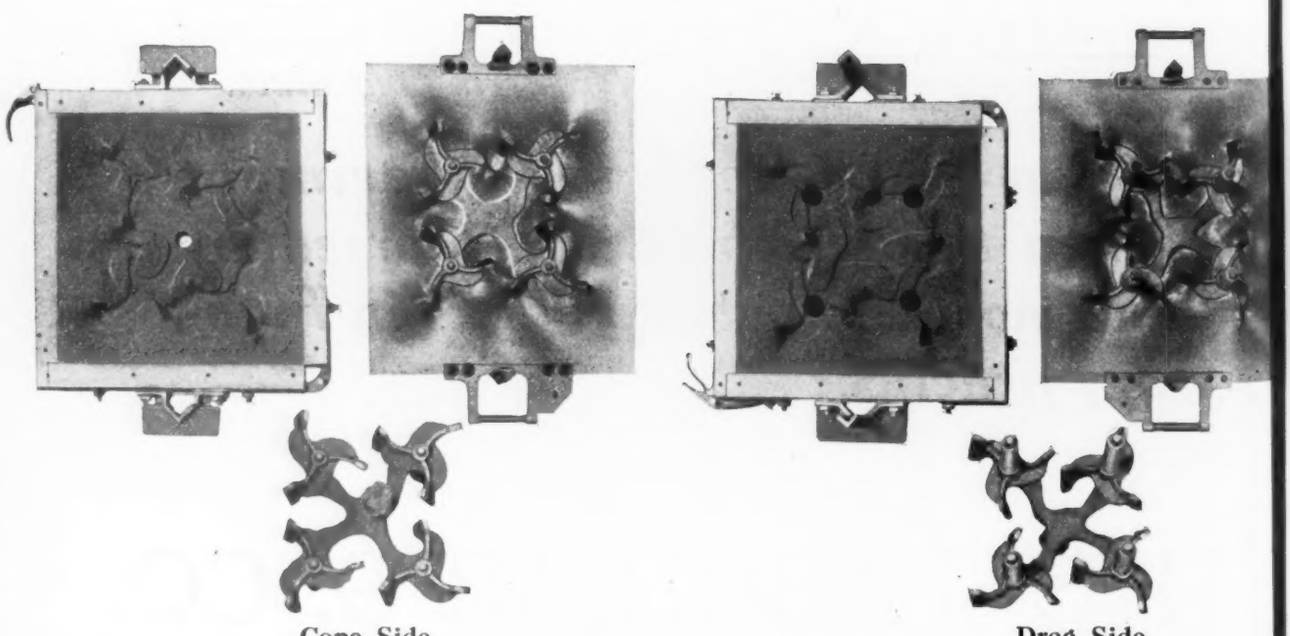
ALUMINUM



Cope Side Drag Side

Covers for Journal Boxes

One per mold



Cope Side Drag Side

Heads Supporting Lawn Mower Knives

Four to the mold

MATCH PLATES

Used principally in conjunction with Snap Flasks

Advantages:—

Eliminates the possibility of ramming down the parting when an irregular pattern having small projections is used.

Reduces to a minimum the possibility of a shift in the castings.

Enables both halves of the mold being rammed simultaneously, whether the parting be irregular or plain.

Avoids danger of bending the gate on delicate work.

Assures the best finish in castings owing to perfect match of the joint surface.

Affords a very efficient way of making molds from difficult patterns on a Power Squeezer.

THE TABOR MFG. CO.

18th and Hamilton Sts., PHILADELPHIA, PA.

Fenwick Freres
Paris

John MacDonald & Son
Mary Hill, Glasgow, Scotland

These are the Farwell Squeezers we showed at the Detroit Convention.

No two alike on these pages

It is not reasonable to expect one type of machine to answer all purposes and this big line is the natural result of selling ten or twelve thousand molding machines and giving every man the type best suited to his purpose.

This experience and the choice of 72 various styles are at your command in the Farwell line alone.

We want to get down to your special requirements and talk about the machine that will save you the most money, so send along a sample casting, or let us know what you make, so we can help you out.

The Adams Company

These are the Farwell Squeezers we showed at the Detroit Convention.

These are the Farwell Universal, Farwell Stool-Plate and Pneumatic machines we exhibited.

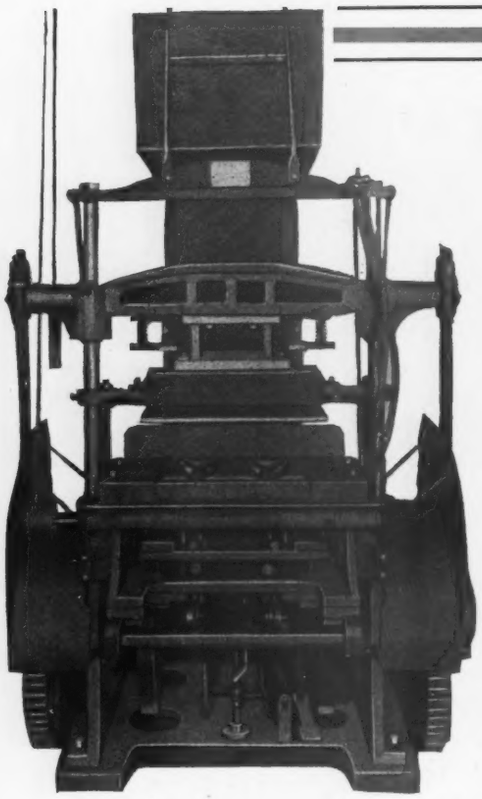
Too big a line for you to overlook

What you want is the maximum output per man with the minimum investment. It has been demonstrated that the Farwell Press will squeeze a mold more quickly than a power operated machine, and without tiring the operator. It has also been demonstrated that three or four men on our plain squeezers will put up more molds per day than the same men operating an automatic machine costing ten times as much as the squeezers. Another point is that when one man lays off the others put up their full day's work and twenty different patterns can be in the sand during the day without reducing output.

Circular 104-F illustrates the Farwell Squeezer.
Circular 105-F tells how it is used.
Circular 125-F describes the Farwell Universal Machine.
Circular 150-F shows the Farwell Pneumatic Roll-Over.

132 Third St., Dubuque, Iowa

These are the Farwell Universal, Farwell Stool-Plate and Pneumatic machines we exhibited.

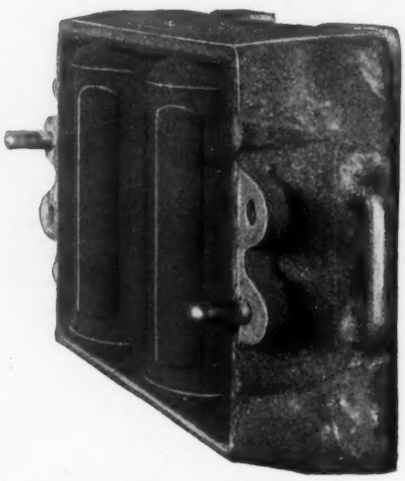


What About Your Undercut Work?

THE Berkshire Automatic Molding Machine, by the addition of a special device, can be equipped to produce all kinds of undercut work. This eliminates the setting of cores in such molds, or the use of loose pieces on the pattern, which would have to be drawn by hand. The mold is undercut while the sand is being compressed. The operation is automatic and does not require the attention of the operator.

By the use of this attachment, all kinds of undercut castings, such as PLOW POINTS, BEARING BOXES with babbitt strips, DOVETAILED SECTIONS, etc., can be successfully molded.

If you have any undercut work that has stumped you, give us an opportunity to solve your problem. Undercut molds are made as easily on the Berkshire Automatic Molding Machine with this attachment as the simplest kind of work.



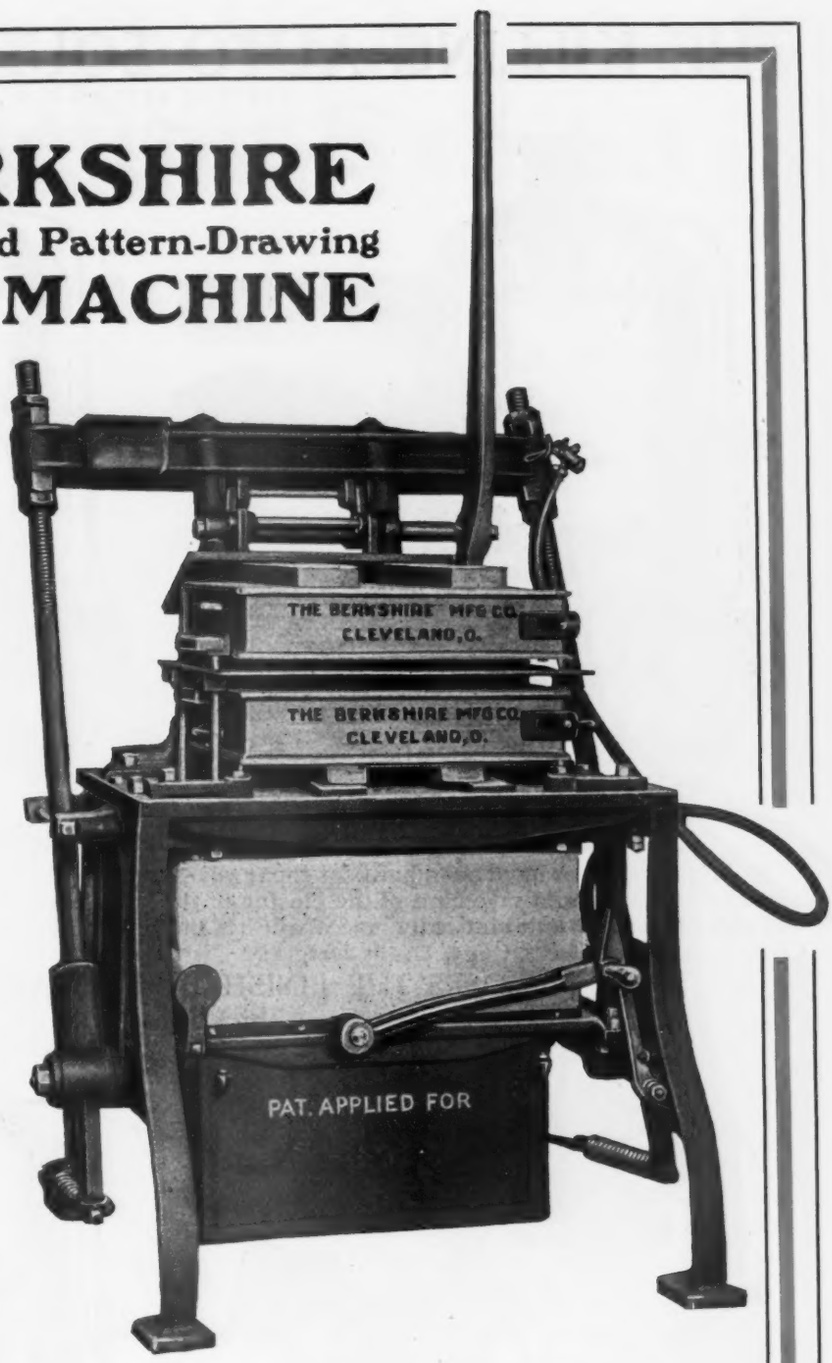
Drag Half of Undercut Journal Box Mold

You have seen the Machine at Detroit —now let us have your orders

The Berkshire Mfg. Co., Cleveland, Ohio

The BERKSHIRE
Hand Squeezer and Pattern-Drawing
MOLDING MACHINE

A marvel of simplicity in molding machine design and construction. Especially adapted for all kinds of plated patterns. Either cope or drag or the entire mold can be made in one operation. The pattern-drawing device insures a steady and accurate lift. The knee vibrator is another feature which facilitates the production of molds. The mechanism of the squeezer head is designed to reduce the exertion of the operator to the minimum making a mold.



THE IDEAL MACHINE FOR HAND OPERATION

This machine can be changed from one class of work to another in less than five minutes. It does not require the constant care of a skilled machinist, nor does a patternmaker have to be called in every time a pattern is changed.

You have seen the Machine at Detroit—now let us have your orders

The Berkshire Mfg. Co., Cleveland, Ohio

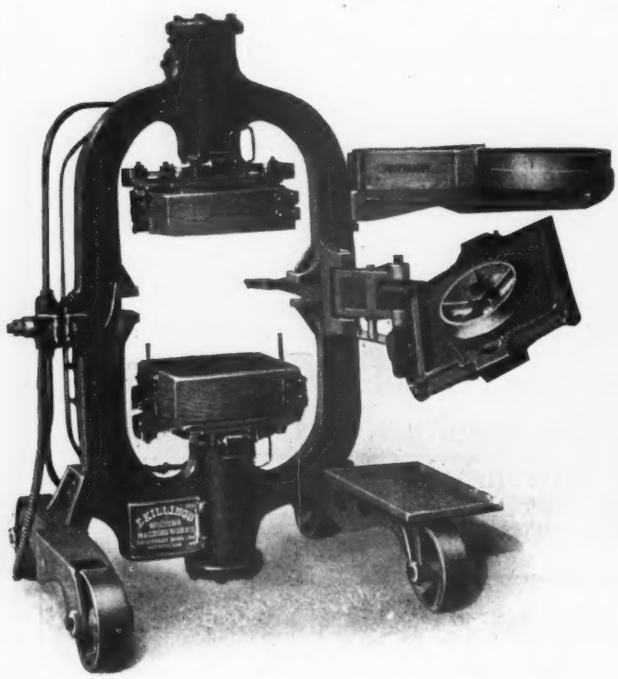
THE KILLING AUTO SQUEEZER "DUPLEX"

(PATENT APPLIED FOR)

The Greatest Triumph in the Molding Machine History

Molding machines have been built for thirty years or more, but **nobody** yet had succeeded in constructing a machine which would take care of the closing of the completed mold. **The Killing Auto Squeezer Duplex will close the mold automatically,** and also Sifts the Sand, Squeezes Cope and Drag, Vibrates the Pattern, Clamps the Flask, Lifts Cope, Drops Drag and

CLOSES THE FINISHED MOLD AUTOMATICALLY



The Killing Auto Squeezer Duplex is made in two sizes:

No. 2—For flasks up to 20-in.x20-in., and 6-in. pattern draw No. 1—For flasks up to 14-in.x14-in., and 5-in. pattern draw

WRITE FOR PRICES

E. KILLING'S MOLDING MACHINE WORKS

DAVENPORT, IOWA, U. S. A.

Builder of complete line of Molding Machines

Send sample castings or blue prints and we will advise you as to the style of machine you need.

THE TWO SENSATIONS of the Detroit Exhibit

THE NORCROSS
JOLT RAMMING
Molding Machine

THE superiority of the Norcross jolt ramming molding machine was demonstrated daily to the thousands of visitors at our booth at the Detroit Exhibit. *Ground Waves,*—there were none. Not the slightest vibration could be detected from the operation of the large Norcross jolt ramming machine displayed.

Molds were rammed weighing 10,000 pounds and the table was 54 x 72 inches. Copes of large molds, with hanging green sand cores, on the floors near this large jolt ramming machine, were not affected in the least by its operation.

The Norcross molding machine received the unanimous indorsement of all of the foundrymen at the Convention using jolt ramming or jar ramming machines of every type.

From one concern already using Norcross jar ramming machines we received an order for 12 additional machines for one of its foundries and an order for 8 machines for another one of its plants.

And why did the Norcrosss jolt ramming molding machine receive the unanimous indorsement of the foundry world?—

BECAUSE of the simplicity of its valve mechanism.

BECAUSE of its short stroke.

BECAUSE of its positive action.

BECAUSE of its low air consumption.

BECAUSE no so-called *Ground Waves* are set up by its operation.

THE ARCADE
AUTOMATIC
Molding Machine

THE peer of all molding machines shown at the Detroit exhibit for duplicate work. This machine was the center of attraction throughout convention week. The section of our booth in which this machine was displayed was constantly crowded with interested foundrymen who marveled at the speed and accuracy with which molds were made.

The Arcade automatic molding machine produces a complete mold every 25 to 30 seconds—an average of 100 molds per hour. This phenomenal output is attained by only two operators.

This machine performs every molding operation automatically—from riddling the sand to drawing the pattern. Both cope and drag are rammed in one operation.

This automatic molding machine has been in course of construction during the last five years. It has been tried out in our own foundry and has been subjected to every possible severe test. It is no longer an experiment—it is the most highly developed labor saving device ever offered to the foundry trade.

The Arcade Automatic Molding Machine

is simple in design and construction.—It has a capacity of 100 molds per hour—It is the ideal machine for duplicate work—It is no longer an experiment but a highly perfected foundry labor-saving device—It requires only two men to operate.

Arcade Manufacturing Co.

Freeport, Ill., U. S. A.

Not Promises ---but accomplished results

This casting is a large boring mill column, weighing 4,532 lbs. It is a complicated pattern, with many loose pieces. The mold weighed 21,850 lbs. The flask exceeded the length of the table of the Norcross Jolting Machine by forty-six inches.

In spite of *these difficulties,* these castings are being made at a *saving in the cost* that will soon pay for the entire installation.

This is but one of a hundred instances that have proved the supremacy of the Norcross Jolting Machine.

If you are ramming up floor work by hand, you are probably paying double what some of your competitors are paying for their castings.

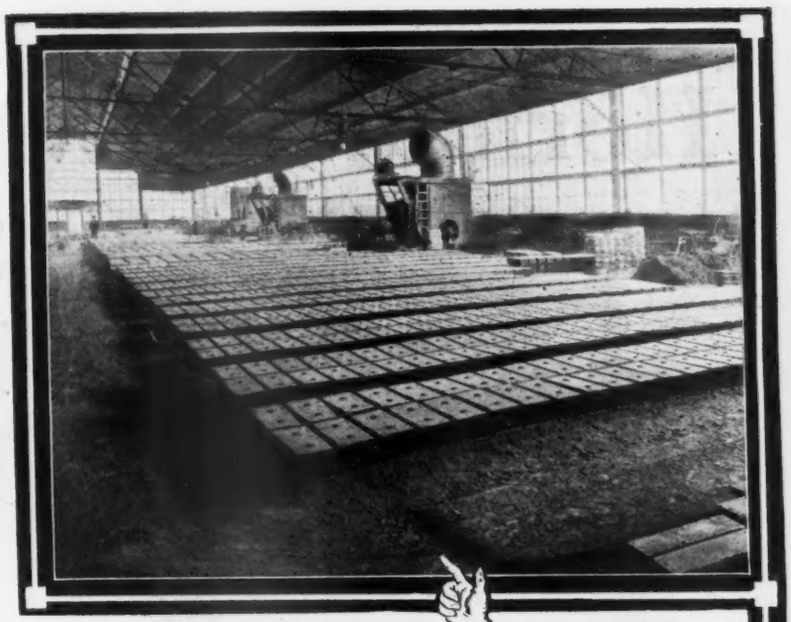
Write today.

ARCADE MANUFA

FREEPORT ILL

Manfacturers of the MODERN MOLDING MACHINE ORCI

PERFECT MATCHPLATE



The Molds shown in this view were all made by Modern Molding Machines.

The reason why this firm has purchased twenty-one of the Modern Molding Machines is because they have found THE MODERN reduces bench molding to an accurate mechanical process.

Every mold is uniform, every casting accurate.

It is a simple, inexpensive machine that any foundry can afford to buy.

This is a big, vital subject that will demand your attention *some day* and *every day* you push it aside you are losing a startling sum of money.

Send us a sketch today of a casting that you are making in large lots and we will tell you truthfully what can be done with it.

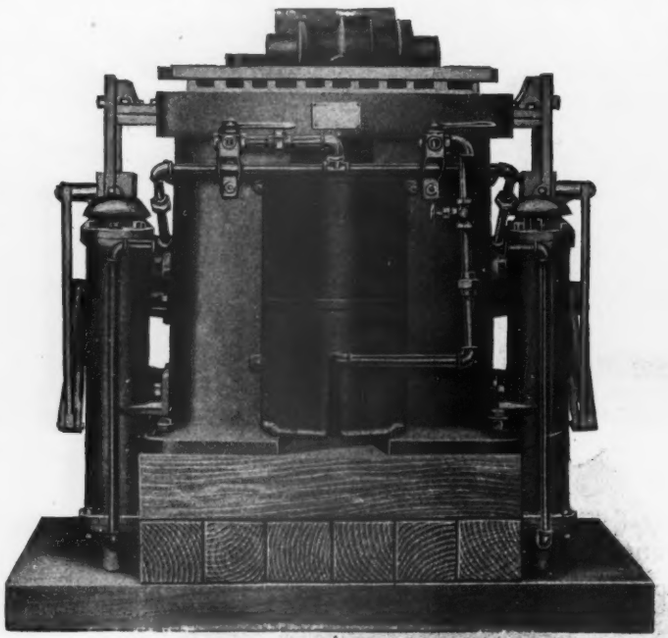
NUFACTURING CO.

PORT ILLINOIS

ACHINE ORCROSS JOLTING MACHINE, ARCADE SQUEEZER,

MATC LATE HINGE

Herman New Jarr-Ram Stripping Plate Machine



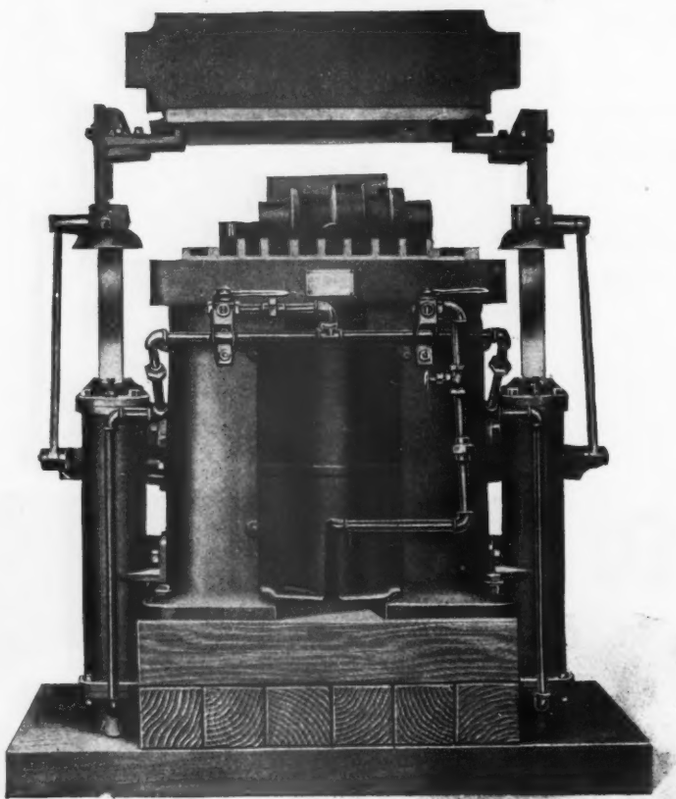


Figure 1 shows pattern mounted on table plate and the stripping plate over the pattern ready to receive the flask.

Figure 2. Mold, jarr-rammed and stripped from the pattern; flask ready to be carried to the floor.

No hand ramming required.

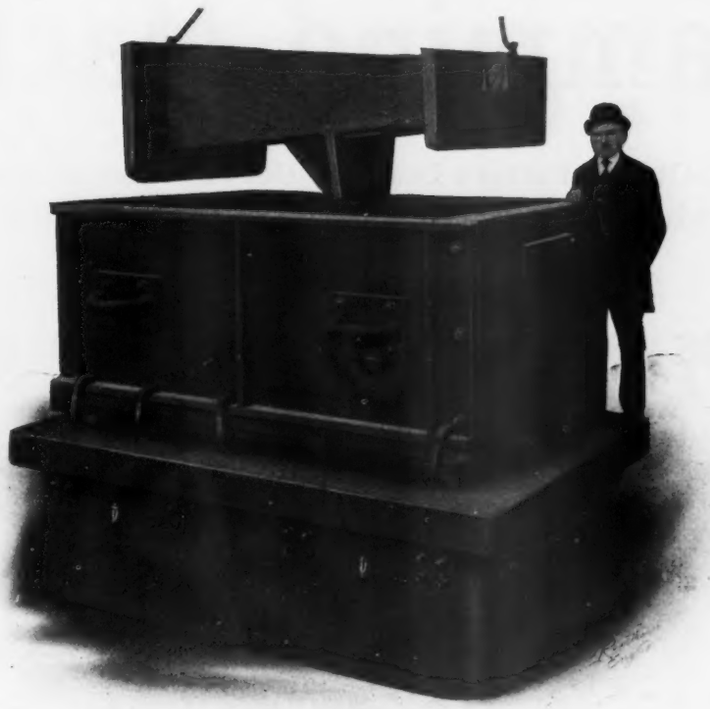
Stripping plates from other makes of machines can be applied to this machine.

Built in the following sizes of table plates:

24" x 30";	30" x 40";	30" x 45";
40" x 50";	50" x 50";	50" x 60";
60" x 60";	60" x 72".	

Herman
Machine
WOR
1104 Union National Bank B

HERMAN BUMPERS



This machine needs no introduction to the Foundry Trade.

Built to take in flasks
24" x 30" to 6' x 10'

Pneumatic Company

ELIENOPLE, PA.
PITTSBURG, PA.

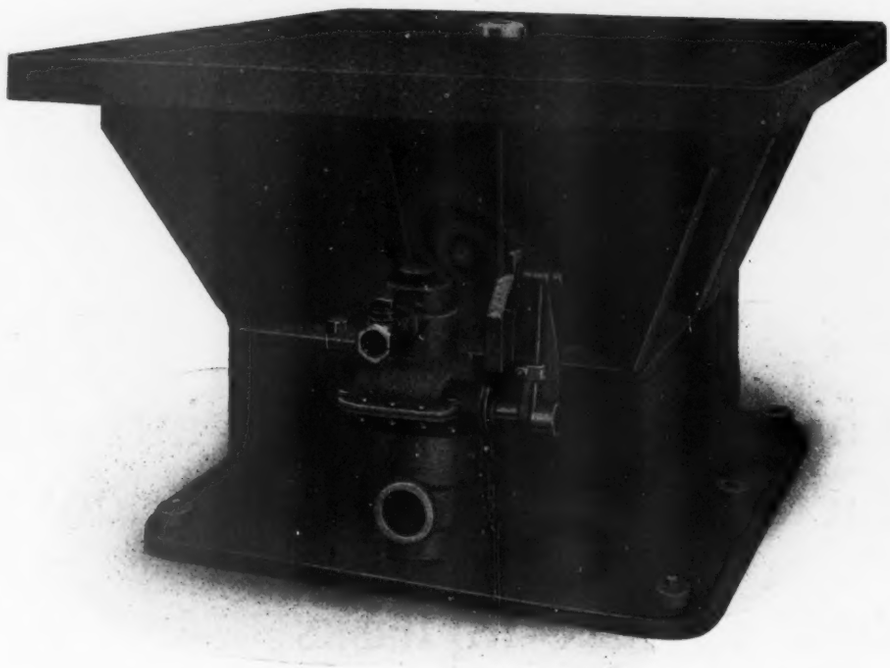
All molds rammed by the jarring process. No limit as to depth of flask.

Mumford Molding Machine Company's
Jolt Ramming Machines

Need No Roll-Over or Pattern Drawing Device When Match-Boards Are Fitted with MUMFORD STEADY PIN PATTERN GUIDE

(Patents Pending)

PERFECT GUIDE—NO BEDDING DEVICE—NO MACHINERY



32" PLAIN JOLT RAMMER
Table 6' x 9'---Capacity 20 Tons

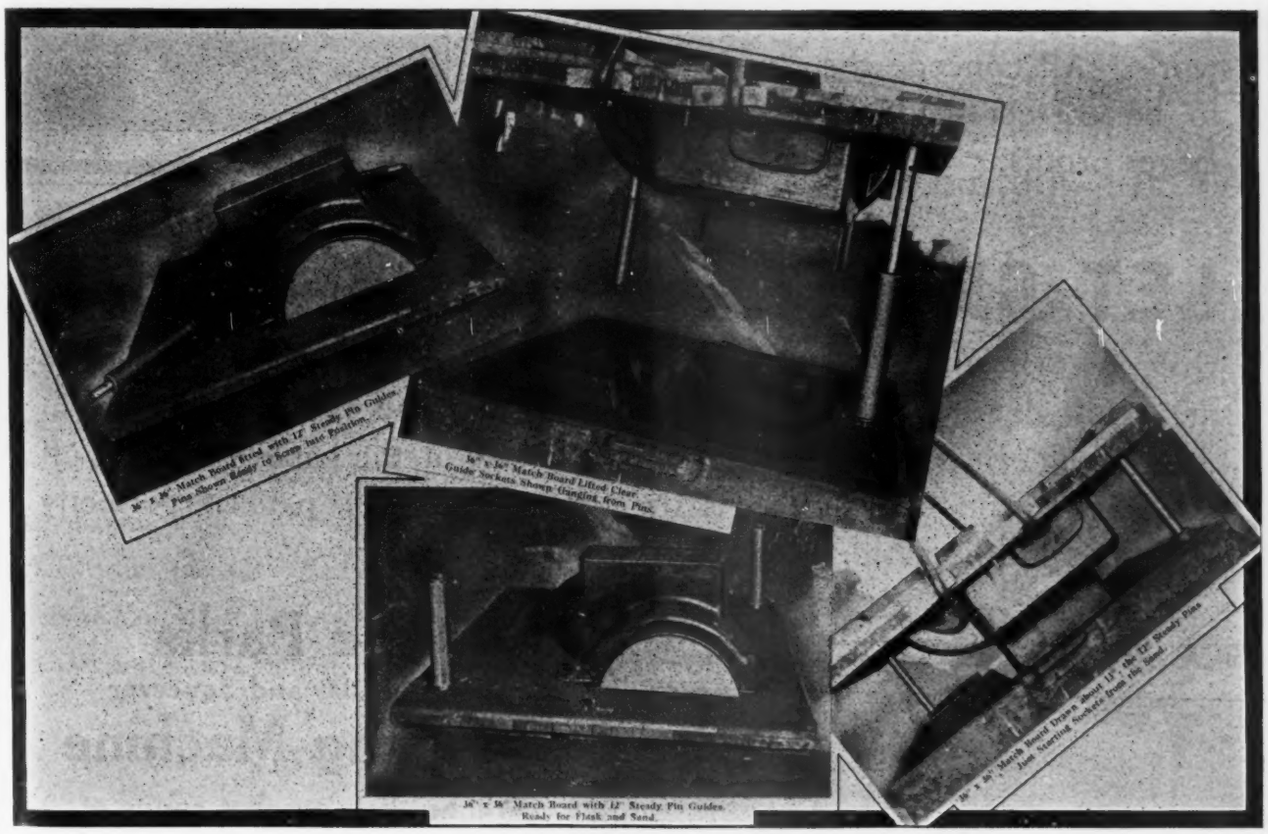
Mumford Molding Machine Company
30 Church St., New York

Chicago,
518 Fisher Bldg.

London,
J. W. Jackman & Co., Ltd.
Caxton House, Westminster

A New Roll-Over Pattern-Drawing Machine

You see the Flask Trunnions? That's the Roll-Over
You see the Steady Pins? There's the Pattern Guide
The Crane is the Rest of the Machine


36" x 36" Match Board fitted with 12" Steady Pin Guides. Pins shown Ready to Screw into Position.
36" x 36" Match Board Lifted Clear. Guide Sockets showing Gauging from Pins.
36" x 36" Match Board with 12" Steady Pin Guides. Ready for Flask and Sand.
36" x 36" Match Board Drawn Away 12", the 12" Steady Pins Just Starting Sockets from the Stud.

Mumford Molding Machine Company

30 Church St., New York

Chicago,
518 Fisher Bldg.

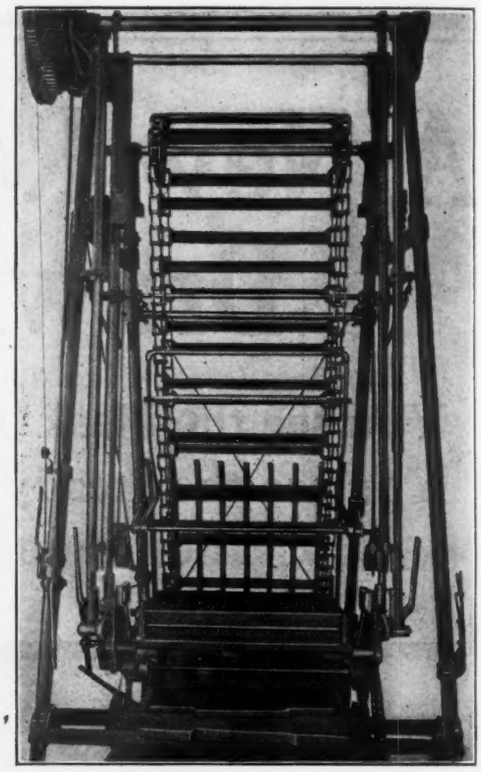
London,
J. W. Jackman & Co., Ltd.
Caxton House, Westminster

"The Greatest All-Around Molding Machine on the Market".

This is the consensus of all who saw the

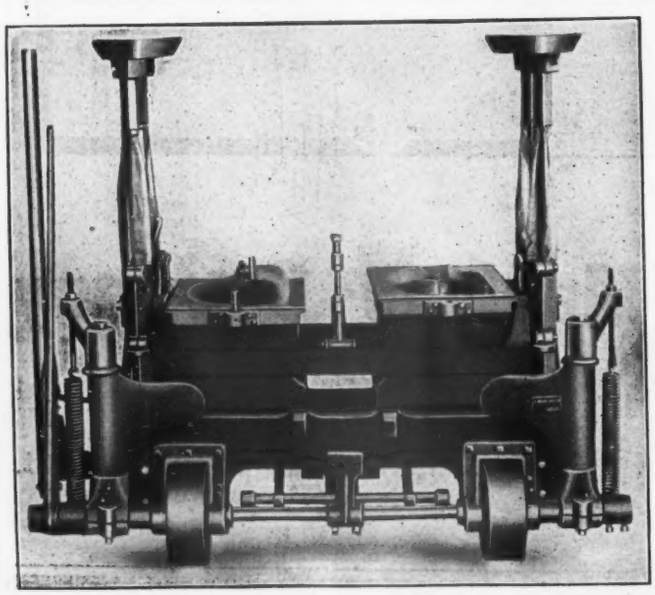
Gravity Molder

demonstrated how simple and perfectly it operates---equally good for standard or jobbing work or for deep and shallow work. All concede the gravity principle to be correct---and the straight way to larger profits.



LET GRAVITY DO YOUR WORK

with one man to control and operate this remarkable machine---riddles the sand---delivers the sand to the flask---rams up the mold uniform throughout, regardless of the shape and size of the pattern---strikes off the surplus sand---turns or rolls the flask---draws the pattern perfectly straight from the mold.



The Parks

Portable Jar and Squeezer

Molding Machine

will handle a **greater range of patterns** than can be mounted on any other squeeze machine. **Jar and then squeeze it on the peer of all machines for snap flask work.**

A. Buch's Sons Co.

Elizabethtown, Penna.

SIMPLIFY YOUR LABOR PROBLEM

It is easy to get one good "handy man" to cut sand with a machine, but it is often very difficult to get half a dozen or more laborers to cut it with shovels. This is especially true in the present condition of the labor market.

Even common laborers do not take very kindly to sand cutting. It is mighty hard work to cut sand with a shovel, and when done the job is not very satisfactory--the sand is not uniform. In many foundries it is not unusual to have a new crew of sand cutters every week. This results in loss of time, worry and confusion, and always means poorly cut sand, followed by rough and lost castings, and ***a loss and waste of your money.***

Why not settle this sand cutting question once for all?

The Auto Sand Mixer cuts sand with perfect uniformity; it breaks every lump, separates and aerates every grain of sand. The heap is left loose and light from top to bottom. It looks, feels and molds like riddled sand.

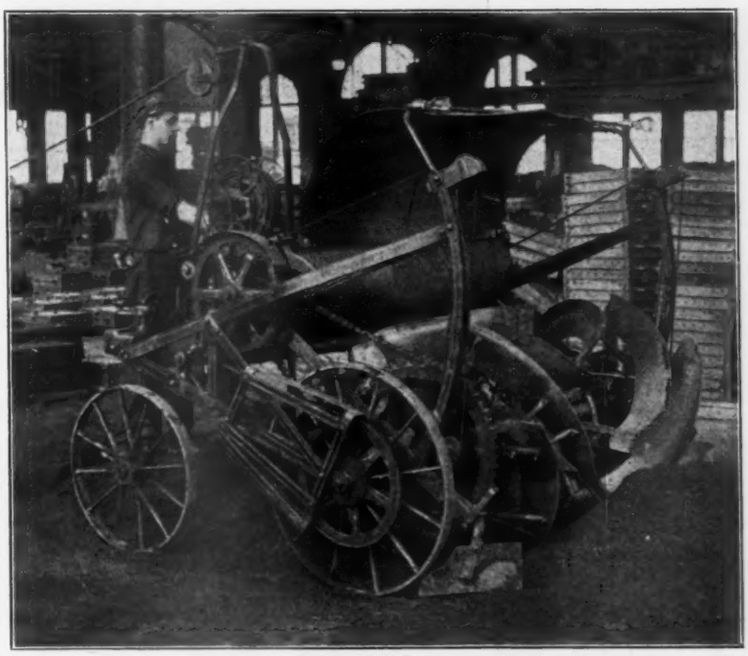
Columbus, O., 4-14-1910

Sand Mixing Machine Co.,
New York, N. Y.

Gentlemen:

I am pleased to advise that this machine has proved a great labor saver and mixes the sand thoroughly.

Yours very truly,
THE JEFFREY MFG. CO.
JOSEPH DIERDORFF,
Supt. Production



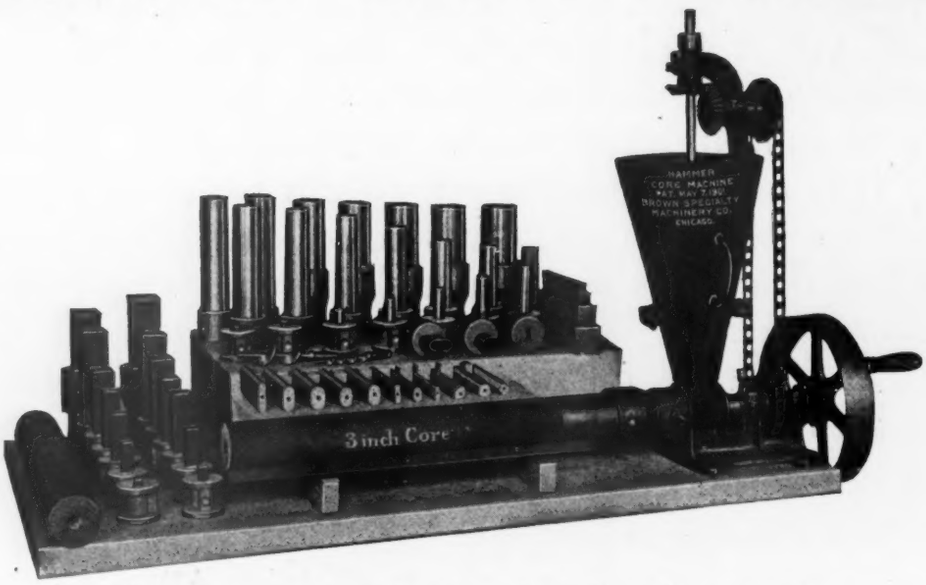
The Auto Sand Mixer in use in The Jeffrey Mfg. Co.'s plant

The Auto Sand Mixer will simplify your labor problem and reduce your loss.

Please write for our Booklet, No. B-1

The Sand Mixing Machine Co.
220 Broadway, New York

Hammer Core Machine



The first core machine invented, and in standing the test of ten years use has proven the most perfect core making machine on the market

Write for new catalog and sample core

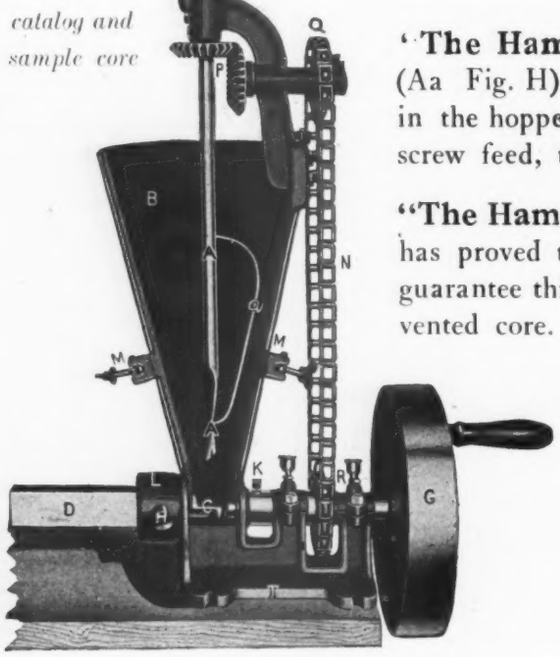


Fig. H

"The Hammer" is equipped with a patented force feed (Aa Fig. H) which absolutely eliminates "clogging" of sand in the hopper and forces a steady supply of sand onto the screw feed, thereby insuring a *uniformly* solid core.

"The Hammer" system of venting the core (also patented) has proved to be the most successful used. We absolutely guarantee this machine to turn out a smooth, solid, perfectly vented core.

"The Hammer" tubes used are made so as to reduce friction to the smallest possible degree.

We will send the "Hammer" to you on 30 days' trial - -

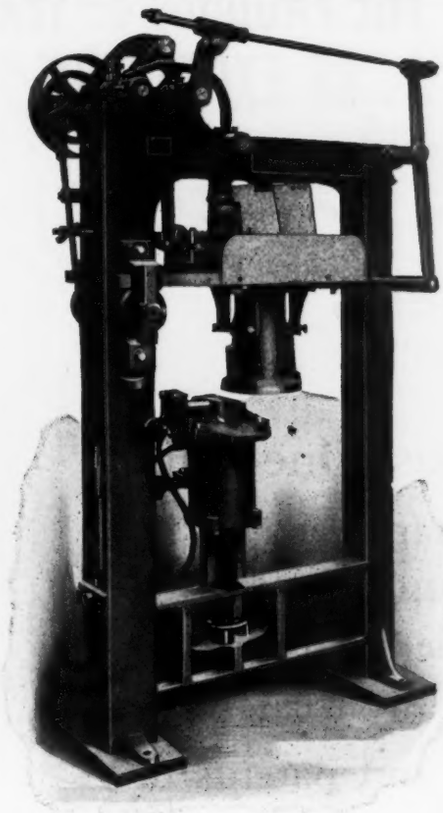
Look Into Your Core Costs and Write Us.

BROWN SPECIALTY MACHINERY CO.

Jackson Boulevard and Clinton St., Chicago, Ill., U. S. A.

FOREIGN REPRESENTATIVES:

CANADA—Dominion Foundry Supply Co., Ltd., Montreal and Toronto
FRANCE—Fenwick Freres & Co., No. 8 Rue de Rocroy, Paris
ENGLAND—Selson Engineering Co., 85 Queen Victoria Street and Lambeth Hill, London, England
RUSSIA—Oscar Ede & Co., Moscow, Russia
AUSTRALIA—Thos. McPherson & Son, 582-588 Collins St., Melbourne, Australia
GERMANY—Schuchardt & Schuette, Berlin



HEWLETT CORE MACHINE

PATENTED

The Hewlett Core Machine is operated by belt power requiring about one-fourth H. P. to operate.

The sand is introduced into the core box by compressed air at 75 lbs. pressure for oil sand mixtures and 100 lb. pressure for ordinary sand mixtures.

It requires about twice the area in compressed air to fill a core box as the area of the core box.

Cores may be made in gang core boxes, limited in number by such size of core box as may be easily handled.

Irregular cores or tapered end cores may be made as easily as straight shapes.

Cores made by this process do not require any additional venting, they are filled with very fine pores.

This process has proved practical, both in quality of product as well as greatly increased quantity.

Seven boxes per minute, with one or more cores in each core box, can be made easily by one operator; by employing two operators, can make twelve boxes per minute.

This machine chucks and fills the core box automatically.

This is a Standard Core Machine designed to meet every requirement for efficiency, convenience and durability; has a range of adjustment from 1 in. in length to 12 in. in length.

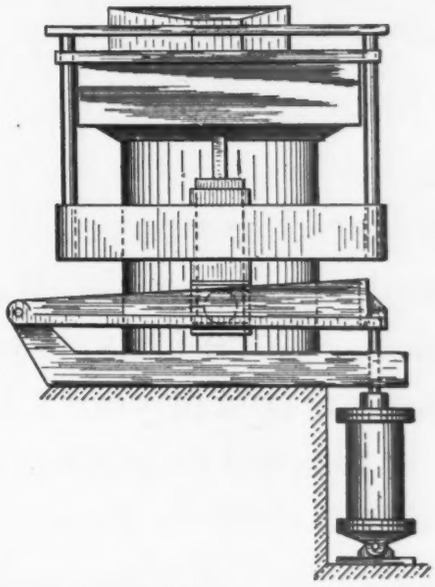
All machines tested before shipment.

We will be glad to have you inspect this Core Machine.

KEWANEE
JAR RAMMING MOLDING MACHINE

Accurate Lift

Perfect Adjustment



Perfect Automatic Valve

Air used expansively

WM. DEMMLER & BROTHERS

KEWANEE, ILL.

A New Core Oil

THE PRODUCT OF YEARS OF EXPERIENCE

I. M. C. CORE OILS

A New Process
PATENTS GRANTED

Reduces the Oil Cost at least One-Half.

I. M. C. Core Oils are guaranteed to be **uniform, superior** and **economical;** free from acid or injurious ingredient; using the best **Vegetable Oils,** scientifically treated.

We control the shop-rights and patents of this process, which can only be used **in connection with our I. M. C. Core Oil without extra shop-right royalty.**

This **Process increases** the **efficiency** of all **Core Oil** or **Linseed Oil** from **50** to **250 per cent** in the making of cores, and **reduces** the **smoke** from the core in the **same proportion.**

We are prepared to **prove,** by actual demonstration and by using the Patent Process and our **I. M. C. Core Oils, a saving of** at least **one-half** the cost of your **Core Oil bill,** and we will be pleased to **prove** same **at our expense** with **no cost** to **you.**

The Independence Manufacturing Co.
Meadow and Wolf Streets
PHILADELPHIA

¶ Yes, and many times $1,000.00 is being saved every year by foundrymen who are using NATIONAL CORE OIL to bind their sand. It is different than other oils---it will bind in better proportions and will give better results. It will save from twenty to forty per cent in your core costs.

¶ We want to say right here that you do not have to take our word for this, and you do not have to take the word of any one for it. We will send you oil enough to make a test and it won't cost you a cent. If we do not make good our claims, we do not expect to get your business. We are looking at it entirely from your standpoint in making you this free trial offer, and are willing to follow it up with a guarantee that the oil will always run uniform, and always be up to our standard.

¶ DO NOT DOUBT---DO NOT HESITATE--- but try for yourself. Sign and mail the coupon to-day.

National Core Oil Co.
CORNING, N. Y.

National Core Oil Co.,
Corning, New York.

Gentlemen: Please send us information about your free trial plan, giving full particulars and instructions for the use of your product

Name .....

Address.....

BLACK DIAMOND

Increased Profits

CORE COMPOUND

Don't Take Chances

Its results are perfect. It will positively do these things---Make a sufficiently strong core in the green to be safely handled. Make a hard, smooth core when baked. Relieves itself easily from the casting, leaving a clean, smooth surface.

Makes good paste. Will not solidify in the hottest weather. Will bind from 30 to 100 parts of sand according to sand conditions, and a large part of it can be old gangway sand.

Does not absorb moisture. Will not swell, crack, blow or buckle. Quality always uniform---results today are the results tomorrow.

Trial lots shipped subject to approval. Its use insures not only satisfaction, but a large saving in binder cost. Write for prices. Do it NOW.

The Millers' Products Co.

BLACK 39TH AND WALLACE STS. BLACK

CHICAGO, ILL.

GLUTRIN

Are you using as much glutrin as you should?
Are you using too much glutrin?
The answer to the last question is just as important to us as the answer to the first one.
If you will write us we can help you on these answers and tell you more about this core sand binder.

Carried in stock and sold by

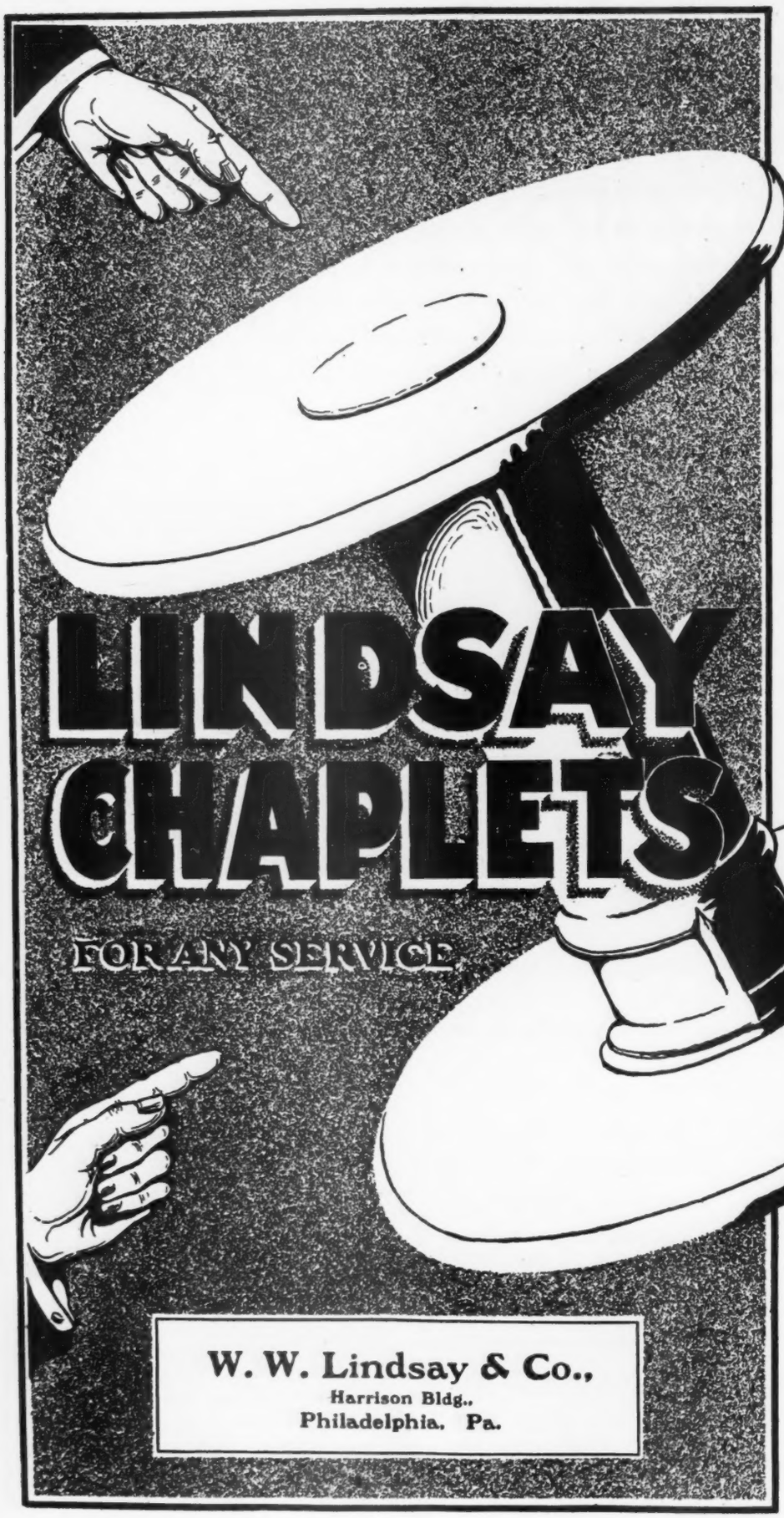
Cutter & Wood Supply Co.	Boston, Mass.
Detroit Foundry Supply Co.	Detroit, Mich.
Henry R. Donald Sales Co.	Milwaukee, Wis.
The Hill & Griffith Co.	Cincinnati, Ohio, and Birmingham, Ala.
Francis Hyde & Company	Montreal, Canada
J. W. Jackman & Co., Ltd.	London and Manchester, England
T. P. Kelly & Co.	New York, N. Y., and Chicago, Ill.
J. S. McCormick Co.	Pittsburg, Penna.
Pettinos Brothers	Bethlehem and Philadelphia, Penna.
The J. D. Smith Foundry Supply Co.	Cleveland, Ohio
M. W. Warren Coke Co.	St. Louis, Mo.

Orders for glutrin can be shipped from the following named points:

Atlanta, Ga.	Cleveland, Ohio	Montreal, Canada
Birmingham, Ala.	Detroit, Mich.	New Haven, Conn.
Boston, Mass.	Jersey City, N. J.	New York, N. Y.
Buffalo, N. Y.	London, England	Philadelphia, Penna.
Chicago, Ills.	Manchester, England	Pittsburg, Penna.
Cincinnati, Ohio	Milwaukee, Wis.	Providence, R. I.
		St. Louis, Mo.

ROBESON PROCESS COMPANY

Au Sable Forks, New York



The Test of Service

—

Precision And Reliability

LINDSAY CHAPLETS are made accurate to size, and are highly efficient in service.

They always give satisfaction. Lindsay Chaplets have been in use for many years. They are strong, and carefully made from soft steel, then coated with pure tin.

The EFFICIENCY of Lindsay Chaplets, together with the prompt shipment from stock of all standard sizes, will justify a trial order.

Write to us

"Philadelphia" Chaplets

ARE MANUFACTURED FROM NEW MATERIAL ONLY, and of extra strength for the purpose of making them **highly efficient.** In all cases where the use of heavy cores demands chaplets that will withstand **high pressure** our "Philadelphia Special" is the thing.

Our method of manufacture eliminates all liability of the chaplets giving way under severe pressure.

We will guarantee the use of our double head chaplets to effect a saving of 10% in your foundry costs. Send us your inquiries and orders and make us prove it.

The "Philadelphia's" are manufactured to sell on their qualities, being made of the best mild steel, and extra strong. We are now fully equipped to furnish double head chaplets with either ROUND or SQUARE plates, and solicit your inquiries and orders, which will have our prompt attention.

The fact that we have grown from an infant to a giant in one year is conclusive proof of the quality of our product.

Prompt Shipments - Satisfactory Results

Write to us

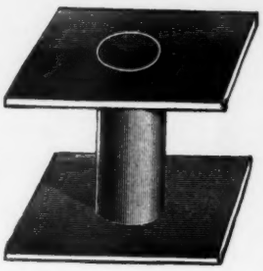
The Philadelphia Chaplet & Mfg. Co.

PHILADELPHIA, PA.

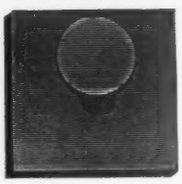
WROUGHT IRON

CHAPLETS

of every description



Our products are manufactured from the *highest grade* **WROUGHT IRON**, and are guaranteed to give the best of satisfaction.

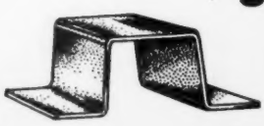


We have a Chaplet for every service, making them in all combinations.

Special sizes made to order. Let us quote you prices.

TIN FERRULE CHAPLET

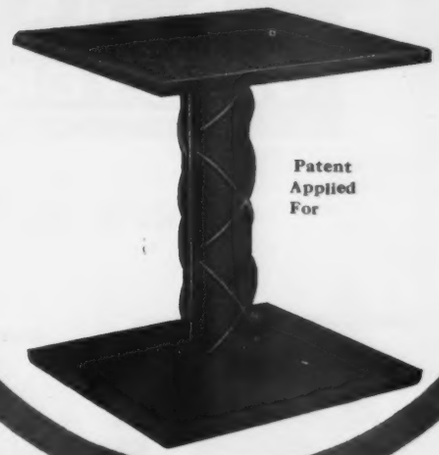
Cleveland Chaplet and Mfg. Co.



ANCHORS

CLEVELAND, OHIO

SHANAFELT WELDED CHAPLET



Patent Applied For

SHANAFELT WELDED CHAPLETS have already found their way into most foundries.

They are *far superior* to other makes, but they *cost no more.*

The plates can't slip down over the stem—they are welded on, making the chaplet practically one piece. The stem is made very rough, so that if the plate is planed off, the stem will key into the casting. **The "Shanafelt" Chaplet can not ruin a casting.** Don't lose a casting for the want of one little chaplet. Get the Welded Shanafelt Chaplet and be sure.

Beside this "Welded Chaplet," we manufacture chaplets of every description—also Steel Cement, Leather and Wood Fillet, Pattern Letters and Figures, Brass and Hardwood Dowels, Pinch Dogs Rapping Plates, Corrugated Steel Fasteners, Fillet Tools, Brushes, Bellows, etc.

Patent Applied For.

Write us about this improved Casting Brush—it's just what you want. It is made so that it can't raise its back

THE SHANAFELT MFG. CO.
1228 W. 9th Street CANTON, OHIO

A PROFIT ON EVERY CASTING

The "Bum" Casting

The above illustration shows a casting made by the "Up-to-date" Foundry, just as it came from the mould---imperfect. This casting in most foundries would have been consigned to the scrap-heap.

Perfected

We next see it in the hands of an "Up-to-date" Foundry workman; he applies Shelton Metallic Filler wherever necessary, and in a short time it is transformed into a clean-cut, perfect casting without a single flaw.

The casting is now aboard the train ready for shipment. It is a rush job, and as the application of **Shelton Metallic Filler** made a make-over unnecessary, it will reach its destination on time.

Mr, "Grouch", the consignee, has received the casting. It arrived on time, and was perfect in every respect; he is thoroughly satisfied and is now telling his friends about it. "Up-to-date" Foundry is due to get more business.

Result

There is no Scrap Heap where

Shelton Metallic Filler

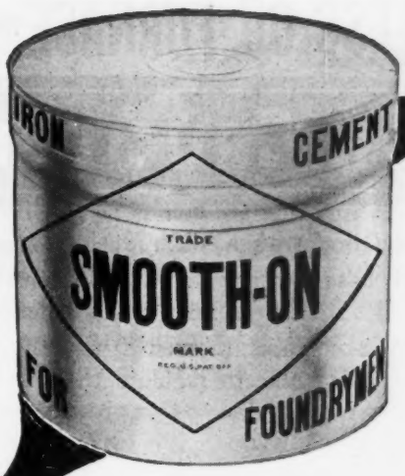
IS USED.

Note the Progress of *one* "bum" casting.

Remember Shelton Metallic Filler will always bring the best results.

Shelton Metallic Filler Co.

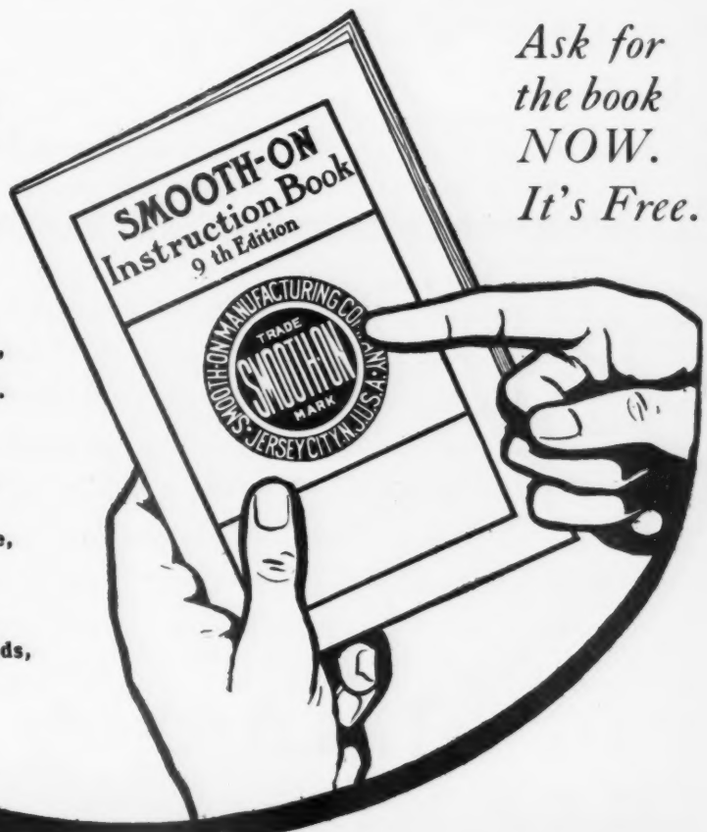
DERBY, CONN.



SEND FOR FREE INSTRUCTION BOOK

THIS Smooth-On Instruction book tells precisely how to make innumerable permanent repairs to castings, boilers, engines, tanks, etc., using the well known SMOOTH-ON Iron Cements. Every foundryman and engineer should have a copy at once. SMOOTH-ON used right is the most remarkable time and money saver known for the foundry, engine and boiler room.

Ask for the book NOW. It's Free.



SMOOTH-ON MANUFACTURING COMPANY

572-574 COMMUNIPAW AVE., JERSEY CITY, N. J., U. S. A.

Chicago Warehouse, 231 N. Jefferson Street.

San Francisco Warehouse, 94 Market St.

English Branch, 8 White St., Moorfields, London E. C.

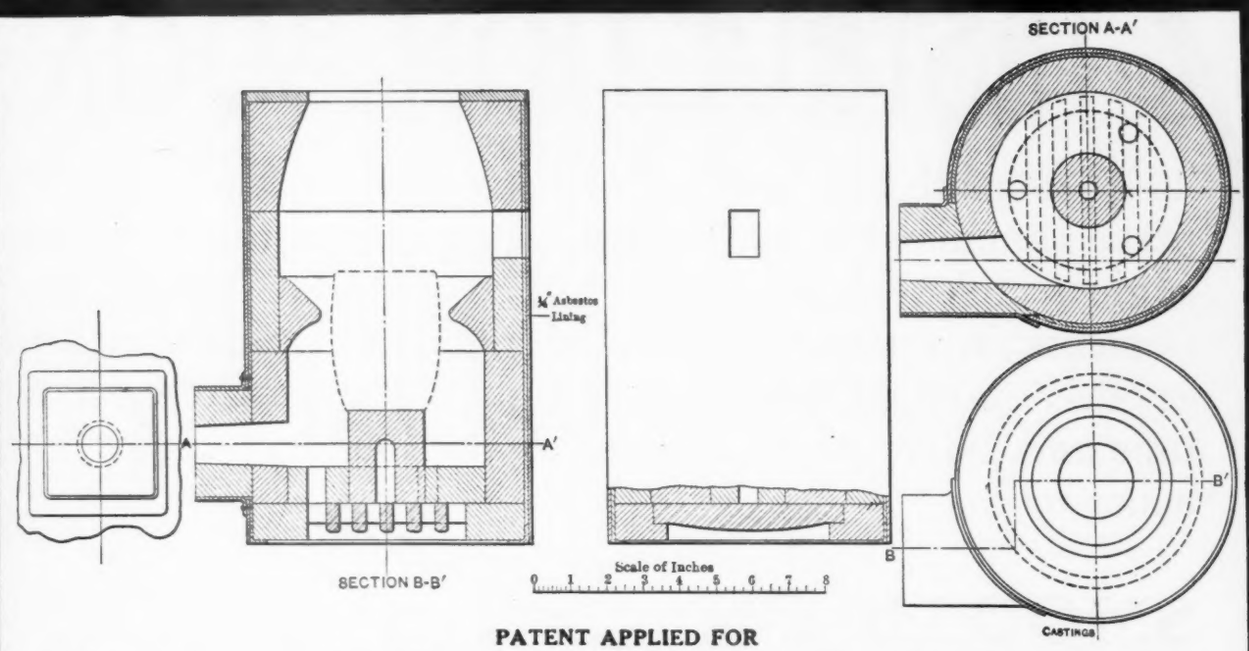
A NEW, SUPERIOR AND NOISELESS OIL FURNACE

FOR MELTING METALS IN CRUCIBLES

By the "Anthony" process the metal is melted in an *ideal way*, with a soft, reducing flame.

The oil-burner is entirely different from any other, and has demonstrated its efficiency and economy by passing through three years of HIGHLY SUCCESSFUL TESTS under service conditions.

The air and atomized oil are admitted into the combustion chamber in such a way that the operator has absolutely independent control of both oil and air, being able to regulate them to meet any demand. As the oil is not atomized by the air, only sufficient air is admitted to produce perfect combustion. The flame is really a gas flame, and the HEAT is put exactly where it belongs. The cool vent allows but little waste (to annoy the attendant) to escape during the operation.



PATENT APPLIED FOR

This is the furnace that melts brass or other metals in ideal style with a soft, reducing flame

The Anthony Furnace is made in several sizes, to receive crucibles of different diameters, and are all certain of having the highest thermal efficiency. The average life of a crucible in one of these furnaces by actual test is over 35 heats.

The Grate-bars are placed in position, when desired, and a change from coal or coke to oil or back again, will never take more than two hours at the most.

We are prepared to furnish complete equipment, comprising **Furnaces, Burners, Strainers, Fans, Pumps, Oil Storage Tanks** and all connections.

WE WILL BE PLEASED TO HEAR FROM YOU

The Anthony Company

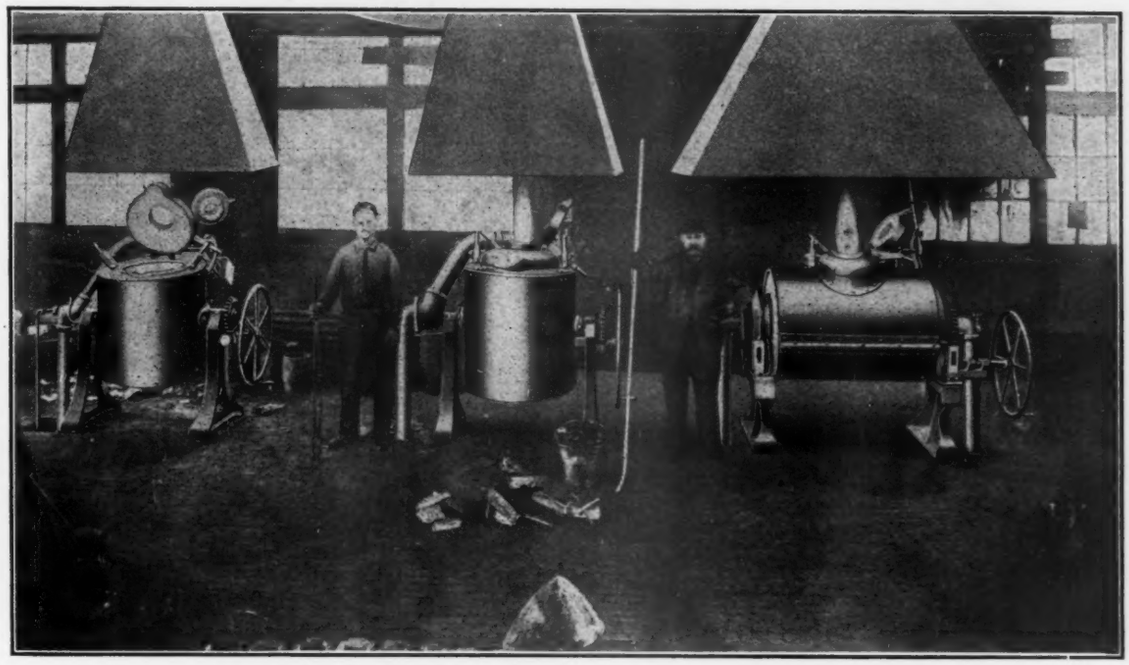
45 West 34th Street :: :: NEW YORK

ROCKWELL
Furnace Facts

When you purchase a furnace do you consider the standing of the makers—what their experience is, what their guarantee amounts to, etc.?

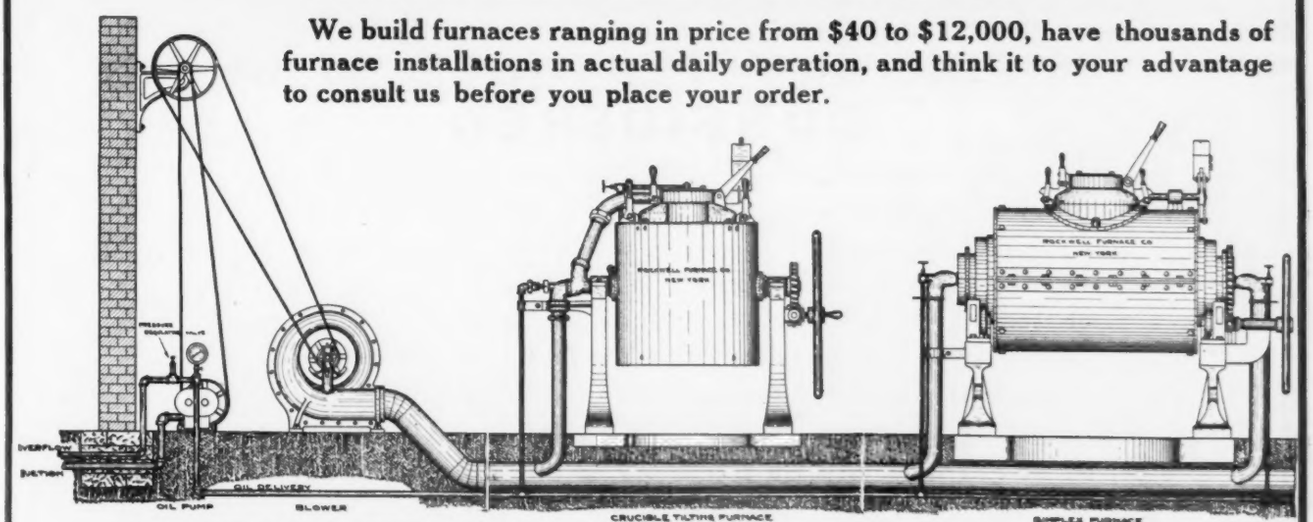
You SHOULD!

We have been building furnaces for over 25 years, and as we stand back of everything we sell and must protect our customers, you are sure not to get a freak furnace or to have the other fellow experiment at your expense.



OPEN FLAME AND TILTING CRUCIBLE FURNACES IN AUTOMOBILE PLANT

We build furnaces ranging in price from $40 to $12,000, have thousands of furnace installations in actual daily operation, and think it to your advantage to consult us before you place your order.



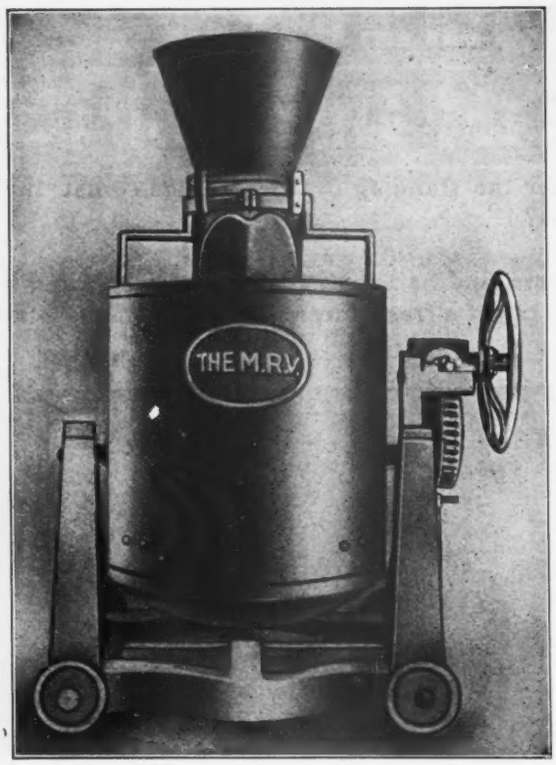
TYPICAL INSTALLATION, SHOWING HOW OIL PUMP, BLOWER, PIPING AND FURNACES SHOULD BE CONNECTED

Note—12 ounces pressure is ample for either furnace.

Prices and specifications covering your requirements for the asking. Write for Catalogue M-2.

ROCKWELL FURNACE CO.

26 Cortlandt Street, NEW YORK



M THE M.R.V. R THE M.R.V. V

Brass Melting Tilting Crucible Furnace Coke as Fuel

¶ Simplicity itself in action; no grate bars; relined easier and quicker than the old pit fires; easiest furnace for men to handle and so best for the owner.

¶ Note carefully my guarantees—strong, but I ask payment only after I have proved them to your satisfaction.

GUARANTEE

I guarantee that one man, working one furnace, will melt in one working day—six (6) heats of metal, either copper, gun metal or yellow brass—capacity 400 to 430 pounds per heat. ¶ Five pounds of metal melted to each one pound of 72-hour coke, average for the day's run. At the average price of coke this figures about six (6) cents per 100 pounds for metal melted. ¶ Metal to be melted to consist of not over 20% of chips, to come within guarantee.

IMPORTANT FEATURES to be CONSIDERED

Cool as compared with any other method of melting. ¶ Therefore less trouble to retain furnace-men. ¶ Long life of crucibles. Coke consumption 50% less than any other method using coke. Fuel cost 50% less than any other method of melting. ¶ Loss of metal in melting 50% less than other methods. ¶ Power to operate less than one-fourth H. P. ¶ Floor space occupied by furnace 6 ft. square. ¶ Installation cost very low.

The M. R. V. Furnace will be Exhibited at the Detroit Foundry Convention

WRITE FOR CIRCULAR

J. B. WISE

401 TO 433 MILL STREET, WATERTOWN, NEW YORK

ROOTS'
FOUNDRY BLOWERS

The Best Positive Blower

BECAUSE:

1st: It is made better than any other.

2nd: It is heavier than any other---very considerably heavier.

3rd: It is more durable and efficient. Ask any user.

4th: We give far more for the money than any other.

5th: It has been the standard for all others for over **FIFTY** years.

P. H. & F. M. ROOTS COMPANY

HOME OFFICE:
CONNERSVILLE, INDIANA

CHICAGO OFFICE:
1547 Marquette Building

NEW YORK OFFICE:
120-122 Liberty Street

Below we print

A Remarkable Testimonial Letter

The No. 4 Roots Blower referred to was sold one year before the oldest competitor we now have, commenced to manufacture Blowers. This speaks volumes for the **GREAT DURABILITY** of our machine.

Hudson, N. Y., Oct. 25, '09

P. H. & F. M. Roots Co.,
120-122 Liberty Street,
New York City

Gentlemen:

In reply to your inquiry of the 23rd inst., would, like the good Yankee, ask another question. What in the dickens do you think we would want of a Blower for use in our foundry when we have a Roots Blower No. 4 that was purchased only thirty-five years ago and is just as good today as it was in 1874? In the language of the boy of the day, would state that you have another guess. It is true that we are about to erect a new plant, but we will take the old '74 Blower with us.

Yours very truly,
GIFFORD-WOOD CO.
Arthur Gifford.

P. H. & F. M. ROOTS COMPANY

CONNERSVILLE, INDIANA

CHICAGO OFFICE:
1547 Marquette Building

NEW YORK OFFICE:
120-122 Liberty Street

ARE YOU RUNNING YOUR FOUNDRY FOR PLEASURE OR PROFIT?

A Comprehensive Review of "MONARCH FURNACE" Exhibit at Detroit, June 6-10

PUBLICITY IS THE LIFE OF "SALES AND TRADE".
Exhibition of "Modern Machinery" Educates the Masses in Economical Foundry Production.

No. 1

Monarch Stationary Pit Furnace

Down Draft, Vacuum Vent, new patented Reverse Cover, cold side to operator. This furnace was viewed by the large number of visitors. It was noiseless and the heat combustion so perfect that with the small cover on it was impossible to conceive of the heat within, producing a white heat sufficient for nickel. The new method of using the waste heat by double hollow lining tiles emerging into the flue duct, and then the passed heat being used in heating.

No. 2

Monarch Acme Core Oven

which was arranged that all shelves were virtually independent. Each tray was arranged with separate outlet flue and damper. We guarantee this oven a marvel for output. Small space and low prices.

No. 4

Monarch "Iron Pot" Stationary Aluminum

or Soft Metal Furnace—the reducing flame and double use of heat before emerging thro flue—the kind we guarantee for output, economy and price.

Original Rocker Cover

No. 3

The Original STEELE-HARVEY

Rocker Cover Furnace—the 50 per cent economy kind—the furnace that has never been equalled for producing castings of brass, bronze, aluminum, etc., at the lowest price. The basic idea for operating above ground. No crucibles removed.

Catalog F-4, 1910, for you "Sherwood Compliments"

No. 5

Monarch "Hopper Feed" Rivet Furnace

Continuous heat. Good for 24 continuous hours heating. Five hundred rivets per hour.

No. 6

Monarch "Patented" Eclipse Bolt Heating

and Rod Forge. Water jacketed and fitted with keyed chilled brick. Adjustable for all diameters and lengths of stock. Guaranteed to double output of ordinary oil forge. Made either for single or double chambers.

No. 7

Monarch Blowers, Pumps

Working automatically and virtually impervious to stoppage or break down.

No. 8

Monarch---Brass Perfection Oil Burners

The acme of "Brass Perfection Oil Burners." The Monarch is the only complete reducing flame restricting the use of oil to a minimum and using all air possible at lowest consistent pressure—air at one pound up. Monarch Oil Burners have been in constant use for eight years.

The Foundry Representatives who passed through "Monarch Midway"—commented on the FACT as usual that the old RELIABLE STANDARD "Furnace Company" led the procession for "practical, up-to-date, modern exhibit" with a full crew of specialists on hand to explain the workings, and as usual, prepared to enter orders for shipments WITHIN 24 HOURS.

DON'T PERMIT any delay in sending us your orders! "HIT WHEN THE IRON IS HOT" and while the exhibit is IN memory. Give us your orders—we'll ship when desired.

The Monarch Engineering & Mfg. Company

OIL and GAS FURNACE BUILDERS

1200-1206 Amerioan Building

Shops: Curtis Bay, Md. **BALTIMORE, MD., U. S. A.**

BLOWING HORNS

You may ask "What's horns got to do with a foundry? Nothing, only somebody told us in our early youth, "Blessed be he who bloweth his own horn, otherwise it shall not be blown," and if we blow it loud enough and often enough, you may sometime stop and listen to our song.

All foundrymen, not too old to learn, know or will know, the wisdom of using Ground 80% Ferro-Manganese and Ground 50% Ferro-Silicon in the ladle.

Many of them know the wisdom of buying it from us, because we make the best stuff to be had. When it comes to quality, we are first and there is no second and third. Let us convince you **AT OUR EXPENSE.**

Metal Manufacturing Company

25th and Dickinson Sts. - PHILADELPHIA

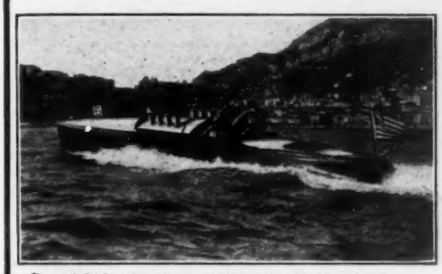
80% Ferro-Manganese
50% Ferro-Silicon

GROUND, LUMP OR PEA SIZE

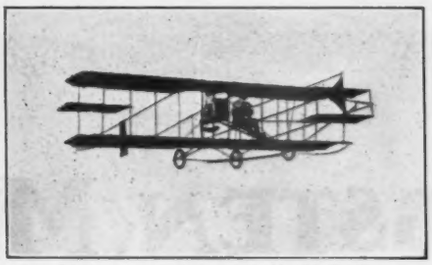
N.B.—By a series of experiments we have made a valuable discovery as to the use of Ground Ferro-Manganese and Ferro-Silicon in the ladle.

If you care to take advantage of this knowledge, it will result in a large saving to you and some profit to us.

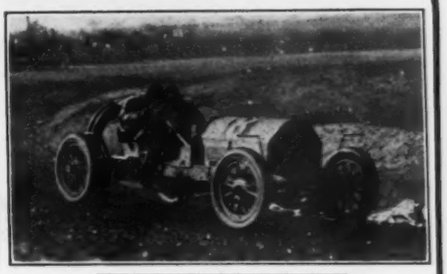
We are going to tell you about it in the next issue of this paper.



Copyright by E. Levick **The Fastest Motor Boat in the World**
DIXIE II
Cramp's Parsons White Brass in the Engine Bearings



Copyright by E. Levick **The Fastest Air Ship in the World**
CURTISS AEROPLANE
Winner International Cup at Rheims
Cramp's Parsons White Brass in Motor Bearings



The Fastest Stock Car in the World
AMERICAN LOCOMOTIVE AUTOMOBILE
Winner Vanderbilt Cup, 1909
Cramp's Parsons White Brass in Bearings of Motor

World-Wide Tribute to Cramp's Metals

The world's highest engineering authorities are united in acknowledging the supremacy of Cramp's Parsons Brasses and Bronzes. Today these metals stand supreme for tenacity, rigidity and durability the world over. In the greatest engineering and mechanical achievements of the age, Cramp's Parsons Metals have been used. The vital parts of every mechanical conveyance now holding the world's record for speed, on land, on sea, and in the air, are forged or cast from these metals.

War ships and Atlantic liners built at our shipyards are equipped with Cramp's Parsons White Brass in the bearings and wearing parts. After years of severe use the bearings are found to be hardly worn from the original dimensions. All the best makes of automobiles and motor boats have Cramp's Parsons White Brass in the bearings and Cramp's Parsons Manganese Bronze in the castings where strength is required.

In the famous Roosevelt dam in Arizona the forged piston rods used for raising and lowering the gates of the dam are made of Cramp's Parsons Manganese Bronze.

The United States, British and German Governments use annually hundreds of tons of Cramp's Parsons Metals.

Such proof of superiority must carry its own lesson. To the Foundryman who seeks higher efficiency of product and the resultant greater profit, the value of using Cramp's Parsons Metals is apparent. For honesty of construction in a machine begins in the hidden parts. Hence, the use of Cramp's Parsons Metals in bearings or castings is conclusive proof of honesty of manufacture.

Whether your metal needs be large or small you can absolutely depend upon the same high quality of product and prompt delivery that have built up our enormous trade with the largest railroad and steamship companies, automobile makers, foundrymen and manufacturers everywhere.

Cramp's Parsons White Brass

This celebrated anti-friction compound is world famous for its wearing qualities. Recognized everywhere as the perfect metal for high speed and heavy pressure machinery. It is especially adapted for pumps, dynamos, saw-mill machinery, paper and pulp machinery, rolling-mills, stone crushers, water turbines, etc. We guarantee to furnish this metal of the same uniform quality that has made it the best known Babbitt Metal in England and America.

Cramp's Parsons Manganese Bronze

World famous as the best and strongest bronze. Exceeds cast-steel in strength and toughness. Absolutely incorrodible. Never crystalizes under vibration. Especially adapted to heavy marine work, motor-boat castings, etc. We have unusual facilities for making castings of this metal in every size and description. We guarantee our bronze to be always of the same uniform quality that has enabled its makers in England and America to build up their present enormous business.

Cramp's Special Bearing Bronze

Specially produced to resist friction and resist wear and abrasion. The anti-frictional qualities of this alloy are far superior to those of Phosphor Bronze, Gun Metal, or any other hard bronze. For certain requirements Cramp's Special Bearing Bronze is the most efficient bearing metal you can use. Write us for additional information concerning it.

Let Our Metallurgy Board Advise You

We invite Foundrymen, Automobile and Motor Boat Makers, Garage Proprietors, Engineers, Machine and Machinery Manufacturers everywhere to write us.

Our Board of Metallurgists will give you complete information pertaining to metals, castings or bearings. Writing involves no obligation. We can show you how you can lower your operation cost and increase the efficiency of your product. In writing for this information, please give full particulars.

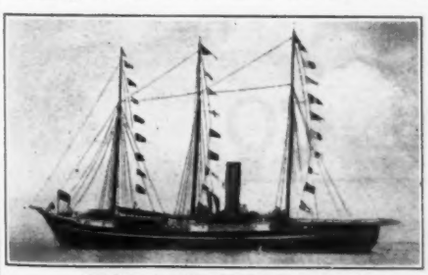
Get These Valuable Books—FREE

We have embodied facts about Cramp's Parsons Metals in pamphlet form, which we will be glad to send you. Everyone who is interested in brasses and bronzes should have this literature. State which of the following books you are interested in:

"Cramp's Parsons Metals in the Foundry."
"A Little Information on Parsons White Brass."
"Automobile and Motor Boat Castings."
"Propellers for Motor Boats."

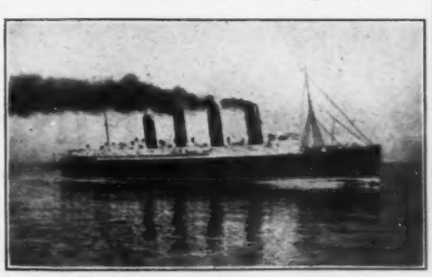
THE WILLIAM CRAMP & SONS SHIP & ENGINE BUILDING COMPANY

Largest in America—Established 1830 **Dept. 31—F, Beach and Ball Streets, Philadelphia, Pa.**



The "Farthest North" Ship in the World
THE ROOSEVELT
Peary's Ship, Uninjured by the Arctic Ice
Cramp's Parsons Manganese Bronze Propeller Wheel

The Fastest Racing Car in the World
LOCOMOBILE MOTOR CAR
Winner Vanderbilt Cup 1908
Cramp's Metals in Crank Case and Engine Bearings



The Fastest Ocean Liner in the World
THE MAURETANIA
Parsons Manganese Bronze Propellers
(Cast by our English Company)

TUNGSTEN METAL

—

FERRO VANADIUM

ALLOYS MADE TO ORDER

PROMPT SHIPMENTS

Tungsten Metal
Ferro-Tungsten
Tungstic Acid
Tungsten Copper
Nickel Tungsten
Tungsten-Molybdenum Metal
Ferro-Tungsten-Molybdenum
Molybdenum Metal
Ferro Molybdenum
Chrome Ores
Chromiun Metal
Ferro Chrome (all grades)

Chrome Copper
Manganese Ores
Manganese Metal
Ferro-Manganese
Cupro-Manganese
Silico-Manganese
Titanium Ores
Ferro-Titanium
Ferro-Vanadium
Cupro-Vanadium
Ferro Silicon (all grades)
Silicon Copper
Red Oxide of Copper

PRIMOS CHEMICAL CO.

Telegram Address: PHILADELPHIA, PA.

PRIMOS, DEL. CO., PA.

FOUNDED 1887

THE UTMOST IN CRUCIBLE EFFICIENCY

Paige Crucibles and retorts stand unsurpassed for quality, durability, uniformity and capacity.

You can't buy a better pot at any price---and speaking of price---our price is **right.**

Foundrymen will find it very much to their advantage to communicate with us.

We make special crucibles for steel foundry work.

Paige Retort & Crucible Co.

TAUNTON, MASS.

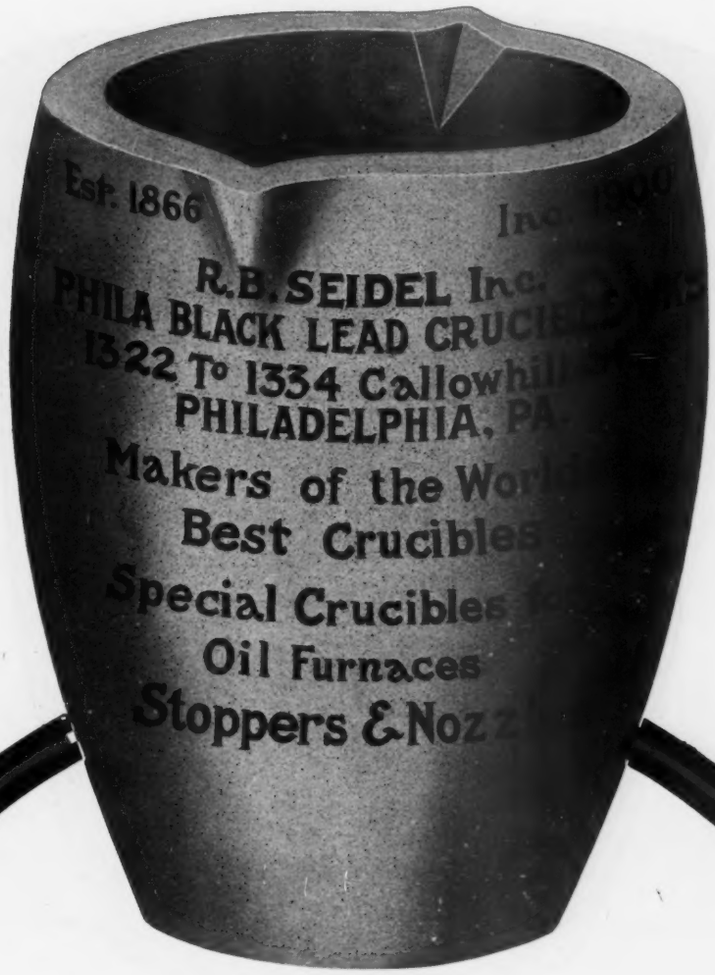
Paige Retort & Crucible Co., Taunton, Mass.
I want to know wherein I can effect a saving by using
PAIGE CRUCIBLES
Name _____
Address _____

THE *Standard* IN CRUCIBLES

Their record stands for dependability, uniformity and durability of more than half a century.

J. H. Gautier & Co.

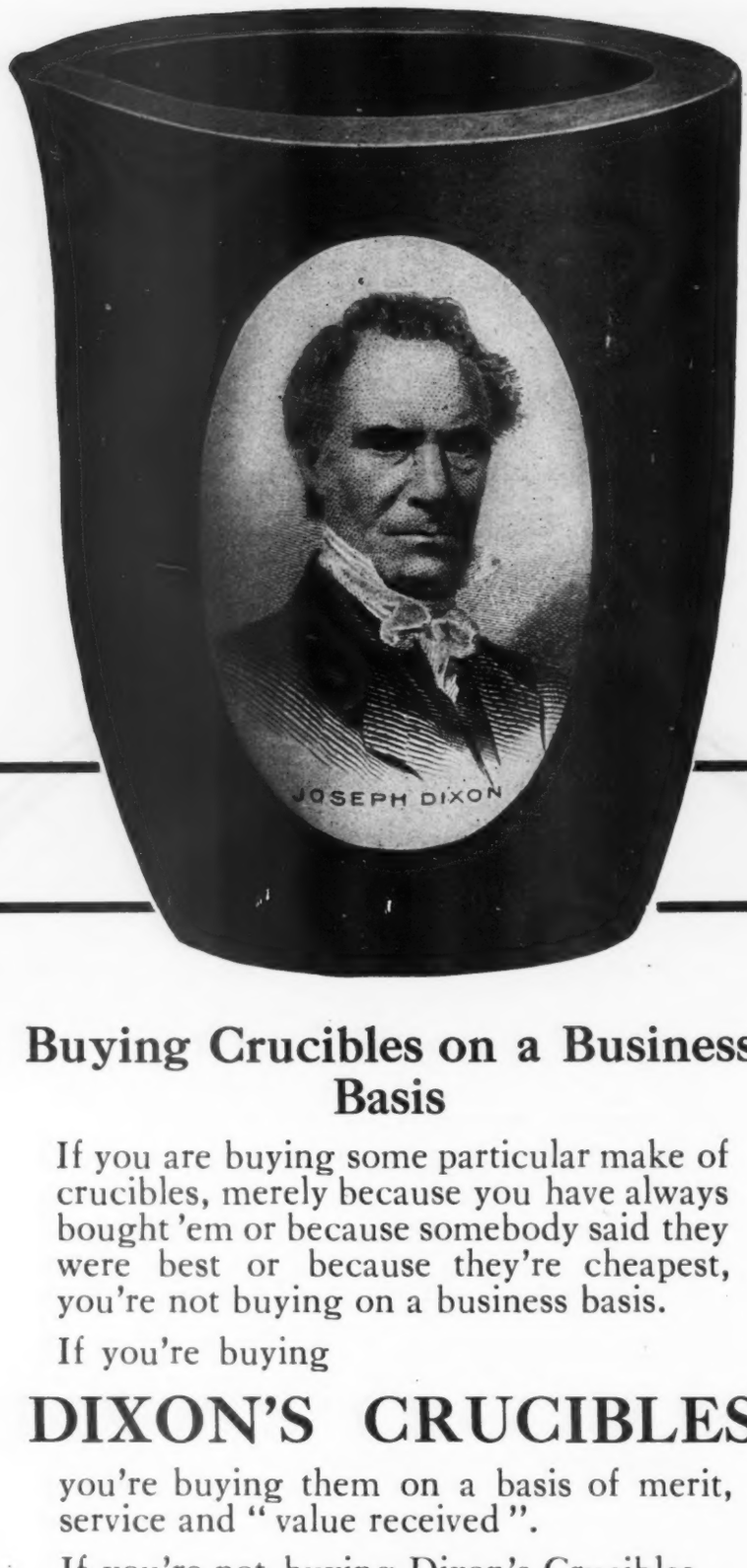
JERSEY CITY, N. J.



EVERY USER A CONVERT

Find a user of Seidel's pots and you will find him enthused. The more he knows of Seidel's crucibles the more convinced is he of their superior efficiency. Are you satisfied with what you are using?

R. B. SEIDEL, Inc.
1322 to 1334 Callowhill Street,
PHILADELPHIA, PA.



1827 1910

Buying Crucibles on a Business Basis

If you are buying some particular make of crucibles, merely because you have always bought 'em or because somebody said they were best or because they're cheapest, you're not buying on a business basis.

If you're buying

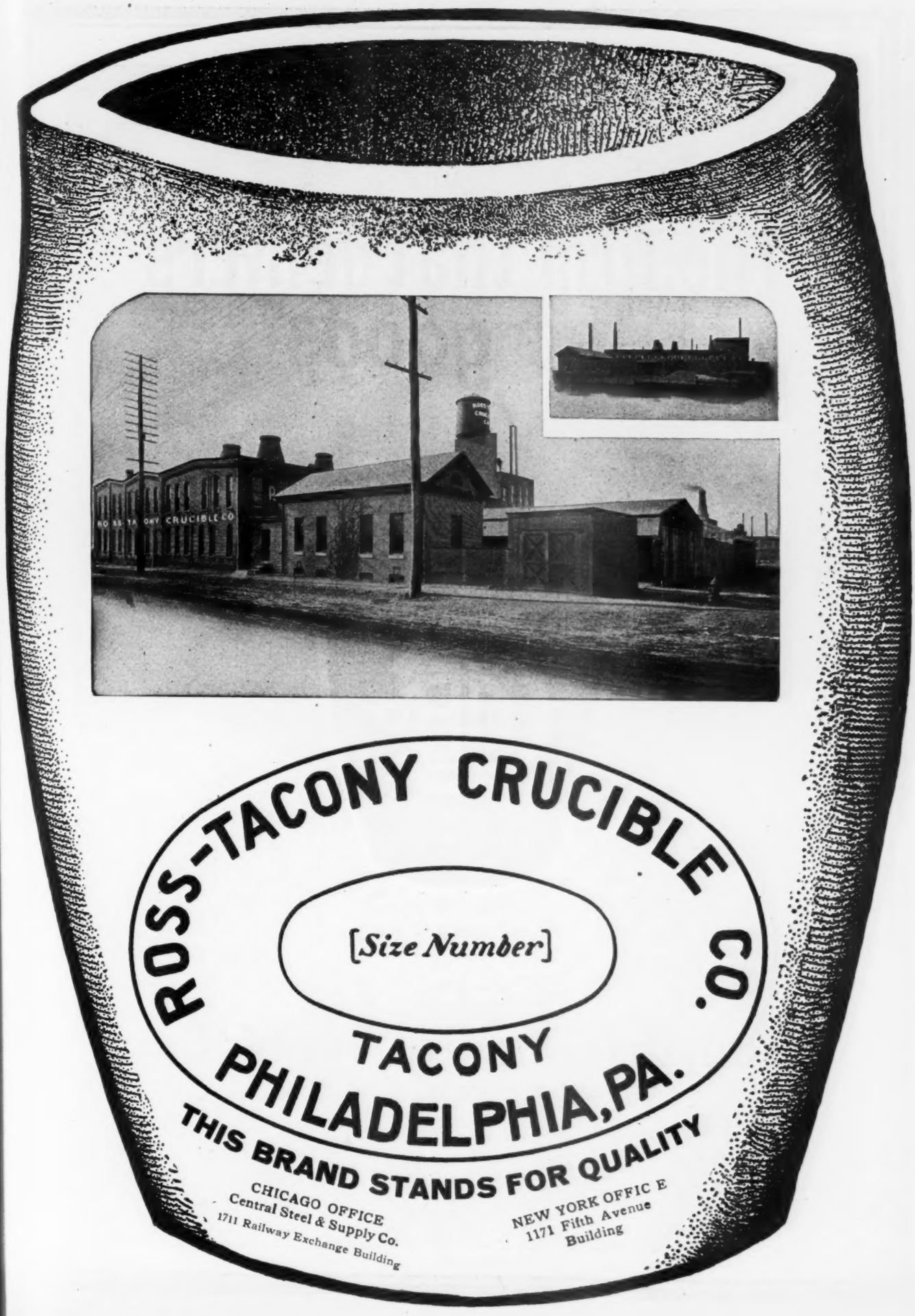
DIXON'S CRUCIBLES

you're buying them on a basis of merit, service and "value received".

If you're not buying Dixon's Crucibles—well, what is the *real* reason? Is it any of the first three we named? Think it over.

Joseph Dixon Crucible Co.

Jersey City, N. J.


ROSS-TACONY CRUCIBLE CO.
[Size Number]
TACONY
PHILADELPHIA, PA.
THIS BRAND STANDS FOR QUALITY
CHICAGO OFFICE
Central Steel & Supply Co.
1711 Railway Exchange Building
NEW YORK OFFIC E
1171 Fifth Avenue
Building

The firm that delivers the goods

Jonathan Bartley Crucible Co.,

TRENTON, N. J., U. S. A.

Crucibles

For nearly 40 years the Standard, the best possible to make.

Uniform, dependable, satisfactory.

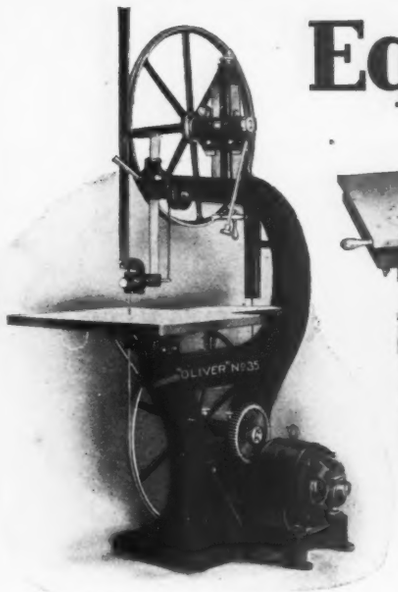
For Lists and Prices address Dept. J

McCullough-Dalzell Crucible Co.

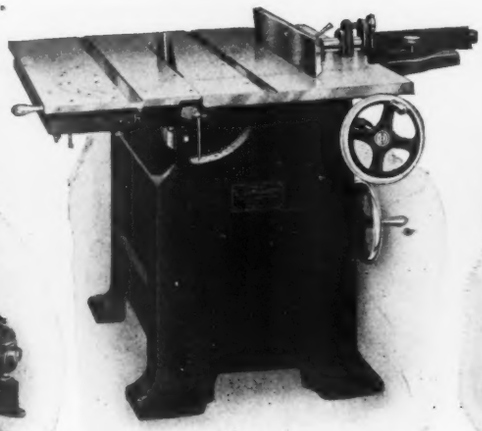
Pittsburgh
Pa.

PATTERN SHOP

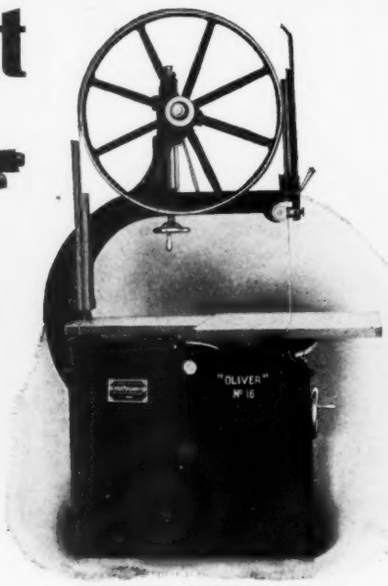
Equipment



"OLIVER" No. 35 Band Saw



"OLIVER" No. 60 Universal Saw Bench

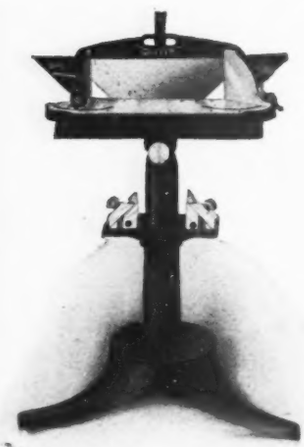


"OLIVER" No. 16 Band Saw

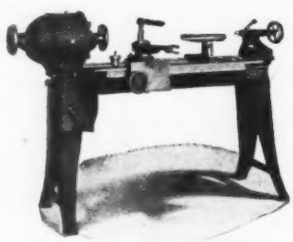
The Oliver Machinery Co. has had years *of experience* in building up-to date and perfect WOOD WORKING MACHINES of *every* description and for *every purpose*.

Our experience will be valuable to you in making your business profitable.

We will be glad to send you a catalog. Write to us.



"OLIVER" No. 9 Wood Trimmer



"OLIVER" No. 53 Wood Lathe

"OLIVER" No. 144 Jointer 6-in

OLIVER
Machinery Co.

17 Mill Street,
GRAND RAPIDS, MICH.

BRANCH OFFICES:

OLIVER MACHINERY CO., Ltd., 201-203 Deansgate, Manchester, Eng. OLIVER MACHINERY CO., First National Bank Bldg., Chicago, Ill.
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URANIUMITE

THE BEST ASSIMILATOR THE MOST EFFECTIVE SCAVENGER

For Brass, Bronze, Aluminum, Gun Metal, etc.

URANIUMITE is not merely a FLUX, it is a metal in itself and adds 75% of its own weight to the poured metal.

One pound of Uraniumite — at 7 cents per pound — in 100 lbs. of new metal not only produces all of the results given below, but, as it is a metal in itself, ADDS MORE THAN 12 oz. to the poured metal.

URANIUMITE DOES NOT ADD TO THE COST OF YOUR CASTING — on the contrary it performs its office of assimilator and scavenger in a most effective manner, and, as each pound of Uraniumite adds 75% of its own weight to the poured metal, it pays for itself and returns a profit of 100%.

The results are even more to your advantage where scrap, gates, etc., are used in the charge.

Let us refer you to a large number of satisfied users who have tested Uraniumite and found that it DOES

1. Eliminate the impurities.
2. Make metal more fluid.
3. Recover all metal from the dross.
4. Make a closer grained and stronger metal.
5. Give a greater tensile strength and elongation.
6. Reduce loss from blow holes.
7. Result in enormous saving in machining.
8. Permit charge to be made up entirely of scrap.
9. Add more than 75% of its weight to the poured metal.

Sample supplied upon application WITHOUT CHARGE.

Prices: F. O. B. Buffalo:

Ton lots	7c per lb.
1000 pounds	8c per lb.
500 pounds	9c per lb.
100 pounds	10c per lb.

The Uraniumite Company of America

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Buckeye Products Co., Cincinnati, O.
Burroughs Adding Machine Co., Detroit, Mich.
Byram & Co., Detroit Mich.
Calumet Engineering Works, Harvey, Ill.
Canadian Machinery, Toronto, Ont., Can.
Carborundum Co., Niagara Falls, N. Y.
Central Fdy. Supply Co., Columbus, O.
Chicago Pneumatic Tool Co., Chicago, Ill.
Cleveland Wire Spring Co., Cleveland, O.
Crivel Co., Geo. F., Buffalo, N. Y.
Curtis & Co. Mfg. Co., St. Louis Mo.
Cutter, Wood & Stevens Co., Boston, Mass.
Detroit Fdy. Supply Co., Detroit, Mich.
Detroit Testing Laboratories, Detroit, Mich.
Diamond Clamp & Flask Co., Richmond, Ind.
Dings Electro-Magnetic Separator Co., Milwaukee, Wis.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Doggett, Stanley, New York N. Y.
Drucklieb, C., New York, N. Y.
Falls Rivet & Machine Co., Cuyahoga Falls, O.
Fay & Egan Co., J. A., Cincinnati, O.
Federal Foundry Supply Co., Cleveland, O.
Fisher, Alfred, Chicago, Ill.
Foundry Specialty Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Gardner Printing Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Goldschmidt Thermit Co., New York, N. Y.
Gregg Mfg. Co., Cleveland, O.
Gulick, Henderson & Co., Pittsburg, Pa.
Hanna Engineering Works, Chicago, Ill.
Hauck Mfg. Co., Brooklyn, N. Y.
Hawley Down Draft Furnace Co., Chicago, Ill.
Herman Pneumatic Machine Co., Pittsburg, Pa.
Hickman-Williams Co., Cincinnati, O.
High Pressure Sand Blast Co., Inc., New York,
Hill & Griffith Co., Cincinnati, O.
Holland Linseed Oil Co., Chicago, Ill.
Interstate Sand Co., Zanesville, O.
Iron Age, New York, N. Y.
Kawin, C. C., Co., Chicago, Ill.
Kelley, T. P., & Co., New York, N. Y.
Killings's, E., Molding Machine Works, Davenport, Ia.
Koppel, Arthur, Co., Pittsburg, Pa.
Kroeschell Bros. Co., Chicago, Ill.
Lindsay, W. W., Co., Philadelphia, Pa.
Lodge & Shipley Machine Tool Co., Cincinnati, O.
McCormick, J. S., Co., Pittsburg, Pa.
MacLeod, Walter, & Co., Cincinnati, O.
Metal Dross Economy Co., Bristol, Ct.
Metal Industry, New York, N. Y.
Millers' Products Co., Chicago, Ill.
Mills, H. E., Mfg. Co., Syracuse, N. Y.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Mumford, E. H., Co., Philadelphia, Pa.
National Core Oil Co., Corning, N. Y.
Newport Sand Bank Co., Newport, Ky.
Northern Engrg. Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Oliver Mach. Co., Grand Rapids, Mich.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Parker Bros. Co., Ltd., Detroit, Mich.
Paxson, J. W., Co., Philadelphia, Pa.
Penton Pub. Co., Cleveland, O.
Peterson T. J., Co., Chicago, Ill.
Pettinos Bros. Bethlehem, Pa.
Phila. Chanlet Mfg. Co., Philadelphia, Pa.
Pickands, Brown & Co., Chicago, Ill.
Pilling & Crane, Philadelphia, Pa.
Piqua Flour Co., Piqua, O.
Pocahontas Coke Co., Cincinnati, O.
Pridmore, H. E., Chicago, Ill.
O. M. S. Co., Plainfield, N. J.
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Rogers, Brown & Co., Cincinnati, O.
Ross Tacony Crucible Co., Tacony (Phil.), Pa.
Sand Mixing Machine Co., New York, N. Y.
Scrutari Trust, Montreal, Can.
Sellers, Wm., & Co., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Squier, Ed. E., Co., St. Louis, Mo.
Standard Sand & Machine Co., Cleveland, O.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Stevens, Frederic B., Detroit, Mich.
Sturtevant, B. F., Co., Hyde Park, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
United States Graphite Co., Saginaw, Mich.
Whitehead Bros. Co., New York, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.
Williams, David (Iron Age), New York, N. Y.
Wise, J. B., Watertown, N. Y.
Wonham, Sanger & Bates, New York, N. Y.

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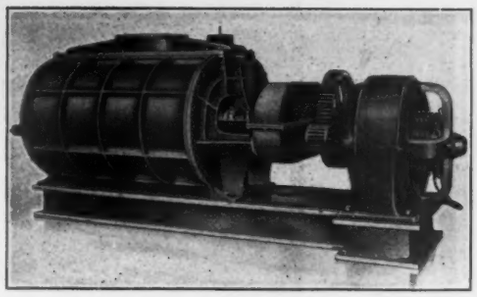

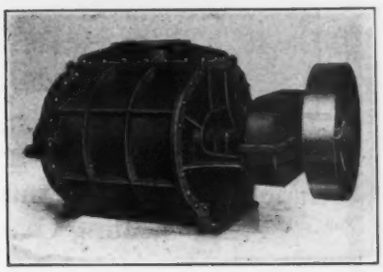

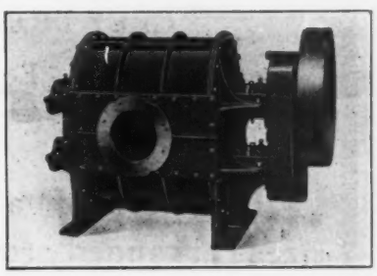

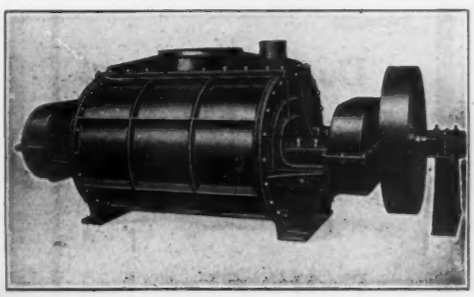

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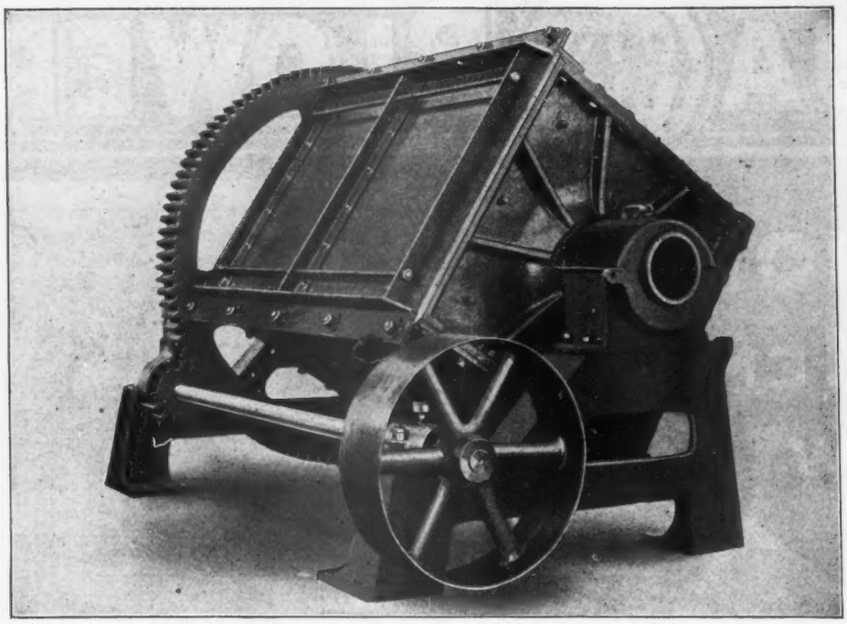

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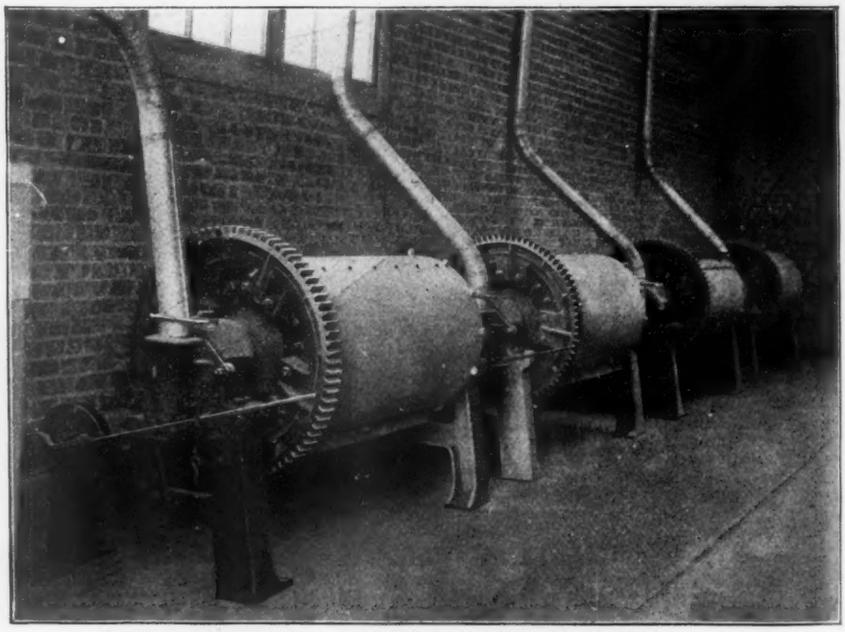

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CONVENTION of AMERICAN FOUNDRYMEN

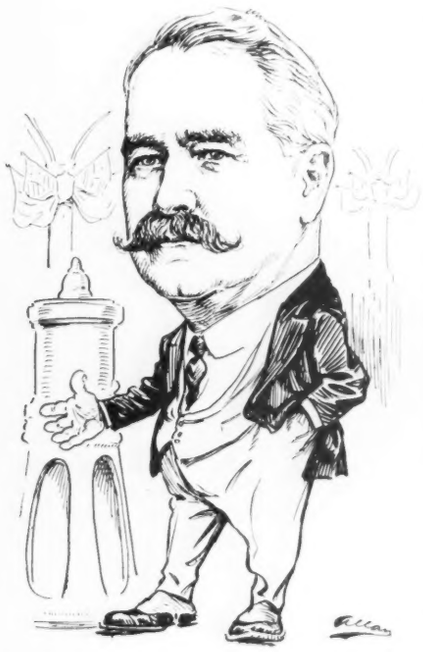
Report of the proceedings of the Annual Meeting of the American Foundrymen's Association --- Associated Foundry Foremen and entertainment features

THE constantly increasing interest manifested in the advancement of the foundry industry of the United States and Canada was reflected by the record - breaking attendance at the annual convention of the American Foundrymen's Association and allied organizations, held in Detroit, June 6-10. The registration exceeded 2,000, and nearly 4,000 tickets were sold for admission to the exposition of foundry supplies and equipment conducted by the Foundry and Manufacturers' Supply Association at the Michigan State Fair Grounds. In addition to the convention of the American Foundrymen's Association, the annual meetings of the Associated Foundry Foremen and the American Brass Founders' Association were held in the Michigan State building. The report of the proceedings of the latter organization appears elsewhere in this issue. Professional sessions were held daily, and throughout the week the exposition buildings were crowded with interested spectators, some of whom came thousands of miles to witness practical demonstrations of the latest labor-saving devices for foundry use.

The convention was opened by a joint session of the American Foundrymen's Association and the American Brass Founders' Association, Tuesday morning. Addresses of welcome were delivered by Mayor Breitmeyer and President Larned, of the Board of Commerce. J. S. Seaman, of Pittsburg, the oldest past president of the American Foundrymen's Association, in his response said that he had had the pleasure of attending all of the conventions of this society since its organization, but he did not believe that the annual meeting was ever held in any city where a more liberal welcome was extended than by the foundrymen of Detroit. Arthur T. Waterfall, president of the American Foundrymen's Association, then delivered the following address: "The fact that a large number of foundrymen travel hundreds of miles to witness the latest developments of the art shows the necessity and the reason for the existence of such associations as are meeting in Detroit this week. This is the fifteenth annual convention of this association, and those of you present who can look back to the earlier years and remember the difficulty in getting men with courage, to tell of their experiments and their successes in the production of a better class of work and at a less cost, note today the willingness of the foundrymen to give this information freely to others engaged in their chosen industry. No longer does the air of mystery surround the foundry that formerly enveloped it, and we realize now that in the interchange of ideas we are mutually helped, and if we give the other man some little thing of value, we cannot fail to absorb from him some information of

MAJOR JOSEPH T. SPEER INSPECTING THE EXHIBITS

the result of his labors. The policy of the American Foundrymen's Association is purely educational. We welcome the employer and the employe equally, to discuss the question of how to do good work. We do not discuss nor consider, in our association work, the question of labor, nor the prices of the products. To those



F. N. PERKINS, THE MAIN SPRING OF THE BIG SHOW

of you who have visited the magnificent exhibit in the exposition buildings on these grounds, conducted by the members of the Foundry and Manufacturers' Supply Association, I would call attention to the marvelous devices for assisting the worker in the foundry, lessening his toil, making his occupation a pleasanter one to follow, and as desirable as any of the other arts.

"The marked advancement in the art of founding as we look back over the past year and note the developments, is encouraging. The permanent mold has been further developed, and other forward strides include the electric smelting of ores and the electric melting of non-ferrous metals.

"During the past year, in accordance with a resolution passed at the convention at Cincinnati, a letter ballot was taken on the proposition of increasing the dues from $5 to $10 a year. The necessity of this increase of dues became apparent to most of us, to meet the expense of the large amount of printed matter sent out by the association, and for defraying the cost of giving information to our members. In addition it is the intention to furnish each member, after convention, with a bound volume of the proceedings. We have had something like 190 requests during the last few months for this bound volume. I have received many letters expressing the hope that the letter ballot would carry, increasing the dues to $10 a year, so that the work of the association should not be impaired. Some of the expenses are being paid by some of the gentlemen of this association, personally, which should be paid for by the members, and I am glad to say that the letter ballot carried, so that the dues, hereafter, will be $10.

"The citizens of Detroit have just realized that we have a large convention here. I was asked how such an exhibition would pay, and I am very glad to state that the State Fair Association, through its board of directors and president, has tendered us the use of these grounds and buildings as a tribute to the foundry industry of Detroit. I want to make that known to you. I want to make it known that their courtesy was freely extended, and I want to let them know that we appreciate it, and we in turn have turned over these buildings and grounds to the Foundry and Manufacturers' Supply Association."

W. R. Webster, of the American Brass Founders' Association, then delivered his presidential address, which appears elsewhere in this number, in

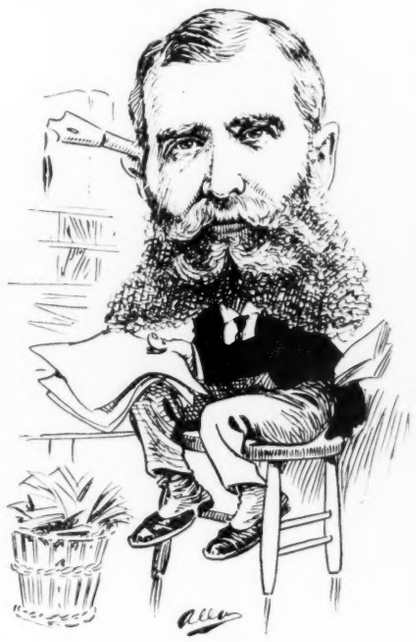
ARTHUR T. WATERFALL SCORED A PRONOUNCED HIT IN HIS SKETCH ENTITLED "MAKING THE WHEELS GO 'ROUND"

the report of the proceedings of this organization.

Report of the Secretary-Treasurer.

Dr. Richard Moldenke, secretary-treasurer of the American Foundrymen's Association, followed with his annual report, which is given in full herewith:

Ten years have now elapsed since the American Foundrymen's Associa-



DR. RICHARD MOLDENKE WAS BUSILY ENGAGED ENROLLING NEW MEMBERS

tion was good enough to entrust me with the executive work pertaining to this office. From the splendid nucleus of foundry pioneers constituting the society at the time my energetic predecessor turned over this work to me, a great association has developed, the like of which may be found nowhere in the world. Go where you will among the civilized nations of the earth, and you will find us well known not only for the excellence of work done, but more particularly for the spirit and advice to those who search for advancement, without desire of recompense—yes, often to a possible business detriment.

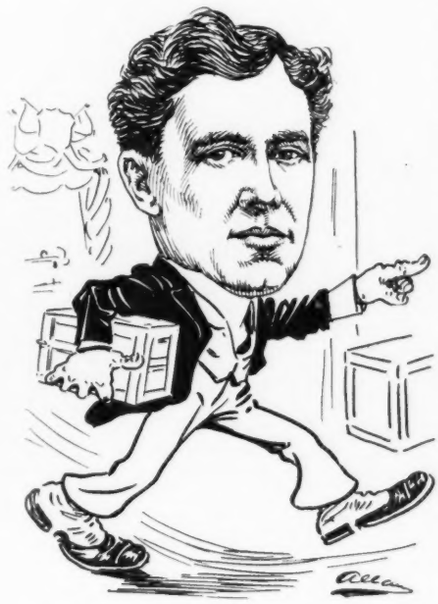
When contrasted with the liberal minded who see in the advancement of the industry as a whole a direct gain to the world, and who do their share either in work or by contribution, or oftentimes both; how small is the individual who sits by without helping, but just the same appropriates any ideas that come along for his advantage. We need more men of broad views. An industry embracing such an enormous number of foundries as North America can show up, should give us members by the thousands instead of hundreds.

Yet we have done well, and with so many warm-hearted members standing behind the organization, there is little wonder that it is looked to as representing the most advanced practice, as furnishing the debating ground for proposed changes in method, as

furthering the betterment of employes and employer alike—for on the broad platform of honesty and truth there is no division. The success of our association is primarily due to its individual members, and long may they hold their friendship and regard for it.

European Trips.

During the year I found it necessary to go to Europe twice. The



C. E. HOYT IN HIS SKETCH ENTITLED "THE EXPOSITION MARATHON"

first time after the convention; the strain from Cincinnati having proved so heavy that it became a question of health to get away, and I combined a visit to the western and central parts of Europe with some interesting investigations into the industrial situation of the countries in question. Beginning at Christiania, the trip extended through Stockholm, Copenhagen, and Berlin, thence through the iron districts of western Germany to Brussels, then Paris, Marseilles, the beautiful Riviera, Florence, Rome, Naples and home. While in Copenhagen, besides meeting the redoubtable Dr. Cook of North Pole fame, I attended the International Association for Testing Materials Congress, which our vice president, Walter Wood, and a few other well known American scientists attended. Mr. Wood and I represented the United States in matters relating to cast iron, and the friendships cemented with the famous Englishmen, Germans, and members of other nations whose names are household words in iron circles will remain bright spots in my life.

During this trip, at the instance of the U. S. government, I also gathered information on the subject of accidents in mines, factories and the like, industrial insurance, and more particularly the complete laws in force in the several countries visited, as related to these subjects. These have all been turned over to the respective authorities, and as I took occasion to travel slowly and where I could speak the language, in a third class carriage, I got into conversation with fellow travelers and thus learned more of the social conditions than could be gotten in any other way. For the student of political economy, and particularly one who has the welfare of his country deeply at heart, this information was highly interesting, and showed that not only here do we have the mad race for luxury with all the attendant evils, but also in staid Germany, frugal France and Belgium, are the conditions exactly the same, from the highest in the land down to the poorest peasant. If we add to this instances that I found where men pay out 15 per cent of their annual income in taxes so that war armament, royalty, etc., may be maintained, it is little wonder that there is a cry to get back to nature again.

German and American Foundry Practice.

The second European trip was a short one, for business in foundry matters, and I took occasion to look particularly into the difference between German and American foundry practice. The foundrymen of North Germany were good enough to call upon me for an evening's talk, and a great assemblage of foundrymen and engineers from all over North Germany were pleased to listen to a general talk on American foundry practice. They send their warm regards to us, and wish us everything that is good.

If I can point to but one great difference in practice, it is that Germans—and I understand the English also—make their castings entirely for the work intended, no matter if the machine shop kicks about hard castings. If they want wear they make their castings in accordance therewith, and no excessive machine shop costs—as we might think them—are allowed to stand in the way. A little of this method would do us good here, where the foundryman is constantly on thin ice when he sends out his castings to a machine shop. We are too much after soft castings here, as you all can testify.

FREDERIC B. STEVENS, GUARDIAN OF THE EXCHEQUER OF THE DETROIT LOCAL COMMITTEE

J. S. SEAMAN, OF PITTSBURG, WHO HAS NEVER MISSED AN A. F. A. CONVENTION

Furthermore, when going into the question of pig irons, strange to say their better brands—and more expensive ones—are all of the rather lower silicon varieties. Quite evidently they still believe in paying high prices for an imported metal that has a name for making strong castings. Some day the fact that other irons with low silicon will do the same will be recognized, and then our customs will get closer together.

Membership.

To turn now to internal affairs. The association now has 753 members, which number excludes those who are in bad standing and cannot be made to pay up their annual dues. What effect the raising of the annual dues to $10 will have remains to be seen. Let us hope that it will not materially affect the membership, particularly as it is the intention to enlarge the *Transactions*, and to furnish a bound volume at the end of the year. This action was highly necessary, for although the books show a balance, if the absence of the secretary for three months in Europe, had not meant

that the association was under no expense during that time, there would probably have been a deficit to show. This will be noted from the expense now necessary for convention arrangements, and the enormous work

W. H. McFADDEN AS HE APPEARED AFTER A TRIP THROUGH THE GLASS BELT OF WESTERN PENNSYLVANIA

of the office, requiring as it did the round sum of $500 in postage.

The finances of the association are as follows:

Balance from last year	$ 28.64
Income during year	2,940.00
	$2,968.64
Transactions	$1,178.53
Printing	135.75
Postage	500.00
Salaries	900.00
Convention Expense	222.47
Sundries	11.61
	$2,948.36

This leaves a balance of $20.28 to report to the association. The work on special investigations is moving along, reports not being ready at this time for publication. The laboratory of Mackintosh, Hemphill & Co., under the direction of H. E. Field, was good enough to analyze all the molding sand for us, credit for this work belonging to E. F. H. Daniels, chemist. The fund has a balance of $340.42, as only $2.97 was expended during the year, and that for freight, etc.

I conclude my report, which is a rather hasty one, with expressing my thanks again to my many friends, who, at Philadelphia, presented me with that token of esteem which, besides forming a permanent monument for my after life, also made possible this magnificent European trip.

The financial report presented by Dr. Moldenke showed an expenditure of only $900 during the year for salaries, notwithstanding the fact that his remuneration is $1,200 a year. J. S. Seaman suggested that the executive committee be instructed to insist upon the acceptance by Dr. Moldenke of his unpaid salary for the year.

Bureau of Mines.

A resolution presented by Major Joseph T. Speer, of Pittsburg, to petition President Taft to appoint Dr. Joseph A. Holmes director of the newly created Bureau of Mines, was carried, and the secretary was instructed to telegraph the president the sentiment of the members of the American Foundrymen's Association. The meeting closed with an exceedingly interesting paper and demonstration of the oxy-acetylene cutting and welding process, by Steelman Stephenson, of Detroit.

Tuesday Afternoon.

"Foundry Efficiency", by Benjamin D. Fuller, superintendent of the Westinghouse Electric & Mfg. Co., Cleveland, was the first paper read at the afternoon session.

"The Personal Equation in Accidents," was the subject of an address delivered by Thomas D. West, which is presented, in part, herewith:

Recently the Minnesota Employers' Association and the Federation of Labor, jointly petitioned the governor of Minnesota, asking an investigation by the legislature, looking toward a change in the present system of compensation for employers in case of accident. The petitioners stated that they were convinced that the majority of accidents that happen

J. S. McCORMICK WAS COMPELLED TO WORK OVERTIME ON THE EXPOSITION RECEIPTS

in the course of employment occur by reason of dangers incident to the employment, and without fault on the part of either employer or employe.

However, to advance the doctrine that the majority of accidents in the

H. F. FROHMAN WAS THERE WITH THE GLAD HAND

trade are incident to it, and neither the employe nor employer is at fault, is a step likely to have serious results. It removes a large part of the personal responsibility from the operative, and makes him heedless regarding the effects of his actions upon the safety of others. Prevention of accidents by the removal of all the factors that tend to cause them should be of prime importance.

An honest effort should be made by both employer and employe to remedy individual faults, which would eliminate 80 per cent of the accidents in shops. The operative must be taught that his part is by far the most important in the life of the shop, so far as liability to accident is concerned, and the doctrine advanced that accidents are inherent to certain industries, irrespective of the conduct of either employer or employe, is a grave and dangerous fallacy.

Oxy-Acetylene Welding.

Henry Cave, president of the Autogenous Welding Equipment Co., Springfield, Mass., discussed the paper presented by Steelman Stephenson on the acetylene-oxygen process, read at the morning session. He said that preheating the castings for autogenous welding did not cause trouble from shrinkage. He added that he repaired cylinder castings, and after they were finished he could detect no variations in the diameter

or other dimensions. When cutting off risers he found that the cost per square inch, using the jet of oxygen, was only 1 cent. He asserted that he could cut 135 square inches per hour by the acetylene process. Furthermore, he related that he had made repairs on gear teeth, and that

J. J. WILSON SHOWED THE VISITORS INDUSTRIAL DETROIT

these were later cut to shape, and that the metal was uniformly soft and easily machined. He also described a method of welding steel to cast iron and copper to steel. The union between these metals was so close that when cut with a chisel they did not separate. He also told of the successful welding of two cylinders to a four-cylinder engine, thereby producing a six-cylinder generator.

Owing to the illness of Edgar Allen Custer, of Philadelphia, his discussion of the permanent mold was necessarily omitted. Dr. Moldenke stated, however, that the development of the art during the past year would later be published in the *Transactions* of the society.

Wednesday Morning.

The report of the committee on Chemical Standards for Iron Castings was presented by Dr. J. J. Porter, of Cincinnati. This is probably the most comprehensive investigation made of this subject, and in addition to discussing the properties of cast iron, a large number of analyses are included, of more than 100 different classes of castings. An extract of the report, which does not include the analyses, is given herewith:

Cast iron is a complex alloy of six or more elements. The common elements are iron, carbon, silicon, sulphur, phosphorus, manganese; and the other elements sometimes present are copper, nickel, oxygen, nitrogen, aluminum, titanium and vanadium.

Iron occurs in three allotropic forms known as *alpha, beta* and *gamma,* whose properties differ greatly. Absolutely pure iron is unsuitable for castings.

Carbon is the most important element in cast iron. It exists in many forms, all of which are included under the two heads of graphite and combined carbon.

There is still much doubt about the iron-carbon diagram. Upton's construction is the most recent, and probably nearest the truth. This diagram holds only for very slow cooling, but gives us a consistent basis of reasoning.

The total carbon is dependent upon the temperature in the blast furnace, the conditions of melting and the percentage of other metalloids.

Graphite and Carbon.

Graphite weakens iron. The amount depends upon the per cent of total carbon, the rate of cooling, the per cent of silicon, the per cent of sulphur, and the per cent of manganese. The normal graphite limits are shown by equations.

Combined carbon hardens iron and may increase or decrease the strength. The amount depends upon the per cent of silicon, the rate of cooling, the per cent of sulphur and the per cent of manganese.

Silicon.

Silicon exists in cast iron in the form of silicides. Its chief effects are through its action on the carbon. Increasing the silicon decreases the

EUGENE W. SMITH EMPHASIZED THE VALUE OF ASSOCIATION WORK TO THE FOUNDRY FOREMAN

total carbon because it replaces carbon in the molten solution.

Increasing the silicon increases the graphite because it replaces carbon in the solid solution, the displaced carbon being precipitated as graphite.

Iron carbon diagrams for commercial cast irons containing 1, 2, and 3 per cent silicon are given and explained. The theory of malleableizing and of Custer's process are explained by these diagrams.

THE "HIGHLAND FLING," BY THAT "MERRIE JESTER," SAM T. JOHNSTON

Phosphorus.

Phosphorus exists in cast iron as the phosphide, Fe_3P, which is insoluble in the solid iron carbon solution. It forms a ternary eutectic containing 2 per cent carbon, 6.7 per cent phosphorus, and 91.3 per cent iron, which has a freezing point of 1,740 degrees Fahr. Phosphorus decreases the total carbon and the relationship is shown by a diagram.

According to Upton, the effect of phosphorus on carbon is to slightly increase graphite and decrease total carbon.

Sulphur.

Sulphur exists in cast iron as iron sulphide and manganese sulphide. Iron sulphide forms a eutectic with iron, melting at 1,780 degrees Fahr. and is insoluble in the solid iron-carbon solution. It therefore forms films between the iron crystals and causes brittleness.

Manganese sulphide does not form these films and is less detrimental. Magnanese has a greater affinity than iron for sulphur and with enough manganese all the sulphur will be in combination with it.

Sulphur has a greater tendency to segregate than any other constituent of cast iron. This tendency is greatest with manganese sulphide.

Sulphur tends to decrease graphite and increase combined carbon. Upton's explanation of this is given.

The presence of silicon decreases the amount of sulphur which cast iron can take up. Much sulphur reduces the total carbon, and vice versa.

Manganese.

Manganese may exist in cast iron as manganese sulphide or as manganese carbide. According to Upton's theory, manganese carbide does not exist but the manganese is in the form of a solid solution. This theory does not seem satisfactory.

GEORGE H. WADSWORTH IN HIS CORE MACHINE ACT

Manganese has little effect on the melting point or composition of the iron-carbon eutectic. It strongly retards the *gamma* to *alpha* transformation and thus tends to harden iron.

Manganese can neutralize sulphur and will also remove dissolved oxide at high temperatures as in the blast furnace.

Copper.

Traces of copper are common in pig iron. Its effects on cast iron are poorly understood. In steel, copper increases fluidity, hardness, and tensile strength, and decreases ductility and ease of forging. Cast iron will take up only about 5 per cent copper and this does not affect the casting properties. Copper accentuates the red-shortness due to sulphur through the formation of the ternary Fe-Cu-S eutectic. Copper prevents a complete evolution of sulphur in iron analysis.

Nickel.

Small amounts of nickel occur in many pig irons. Its chief effect is to lower the *gamma-alpha* transformation temperature and to increase the graphite. Its effects on the strength and ductility of cast iron are relatively unimportant.

Oxygen probably exists in cast iron and causes lack of fluidity, weakness, brittleness, unsoundness, etc. White iron is most liable to this trouble. The variable quality of different brands of iron may be due to more or less oxygen. Deoxidizing agents, such as titanium, vanadium, aluminum, manganese and silicon may be used.

Little is known regarding the effects of nitrogen on cast iron. If present in any quantity it probably causes weakness and brittleness. It exists in iron as a nitride and can be removed by means of titanium.

Aluminum.

Aluminum is sometimes added to cast iron. A few tenths of 1 per cent causes finer grain, freedom from blow-holes, decreases the tendency to chill, decreases the hardness, increases the strength, improves the elasticity. These effects are probably due to its deoxidizing power. Large amounts of aluminum decrease fluidity and increase combined carbon.

Titanium.

Titanium is used as a deoxidizer. It may be added to cast iron as a ferro-titanium alloy in the cupola or in the ladle, or as titanium thermit in the ladle.

Dr. Moldenke's experiments show 52 per cent increase in strength for gray iron and 18 per cent increase for white iron which has been treated with titanium. Only 0.05 per cent titanium is necessary.

Titanium does not affect hardness or shrinkage of gray iron, but on white iron lessens the depth of chill and makes the remaining chill much harder.

Vanadium may be added to cast iron as a ferro-vanadium alloy. Dr. Moldenke's experiments indicate that small amounts greatly increase the strength of cast iron, especially of white iron. It is also thought to increase the resistance to shock.

Strength of Cast Iron.

The strength of cast iron is dependent upon nine factors: per cent graphite; size of graphite flakes; per cent combined carbon; size of primary crystals of solid solution, Fe-C-Si; amount of dissolved oxide; per cent phosphorus; per cent sulphur; per cent silicon, and per cent manganese.

MASTER OF CEREMONIES E. J. WOODISON

The best method of reducing graphite is to reduce total carbon by the use of low carbon pig iron, by melting in the air furnace, or by the use of steel scrap in the cupola mixture.

H. R. ATWATER WAS "THERE" WITH HIS "BUMPER" LINE OF TALK

The chief difficulties in making semi-steel are due to blow-holes, high shrinkage, imperfect mixture of steel and iron, and absorption of carbon in the cupola.

The size of graphite flakes accounts for many cases of difference in strength of irons of the same composition. The factors influencing the size are very poorly understood. Among them may be rate of cooling, pouring temperature, time which iron has remained in the molten state, presence of dissolved oxide, presence of steel scrap in the mixture, mixture of different brands, nature of ore from which iron is made, and treatment in the blast furnace.

From analogy with steel, combined carbon probably increases the strength of cast iron up to about 9 per cent, beyond that it decreases it again.

Size of primary crystals of solid solution Fe-C-Si should, by analogy with steel, be important. This is uncertain.

The effect of dissolved oxide is probably important. To reduce oxide we may get the best brands of pig iron, avoid oxidizing conditions in the cupola, and use deoxidizing agents.

Phosphorus lessens strength, particularly resistance to shock. One per cent produces a marked effect.

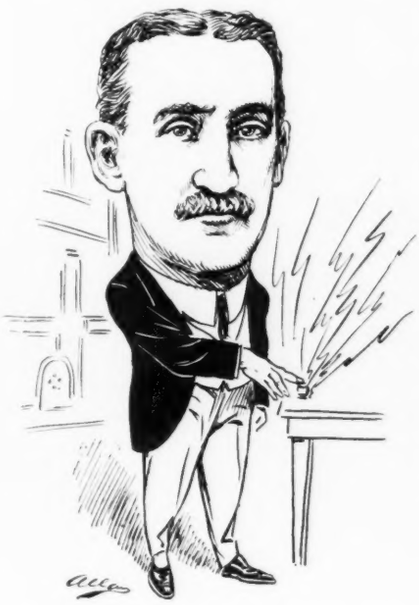
Sulphur may indirectly strengthen iron through decreasing the graphite, but is more likely to weaken it through

causing blow-holes and high shrinkage.

Silicon and manganese act indirectly. Silicon should be kept as low as possible and still have the necessary softness. Manganese should be high, but if too high, produces weakness.

Elastic Properties.

Of the elastic properties, only toughness and elasticity are important



B. D. FULLER DEMONSTRATING HIS "FOUNDRY EFFICIENCY" CONTROL

in cast iron. The sum of these properties is given by the deflection. The factors influencing them are about the same as those influencing strength. Practical rules for obtaining the maximum toughness and elasticity and a table of very tough irons are given.

Maximum rigidity with the least sacrifice of strength and toughness is obtained through the use of manganese and combined carbon.

Hardness is due both to combined carbon and *gamma* solid solution. The latter explains the cases of hard cast iron which are yet low in combined carbon.

Phosphorus has only a slight hardening effect. Manganese may soften iron through its action on the sulphur, but in larger amounts will harden it. Sulphur is an energetic hardening agent. Silicon softens iron due to its action in decreasing combined carbon up to a certain point. Beyond this point it hardens, due to its direct action. The relationship between hardness and silicon is shown by a diagram.

Combined carbon is the chief hardening agent in cast iron. *Gamma* solid solution is formed by rapid cooling from above 1,300 degrees Fahr. and may cause hardness in some cases.

Chilled Iron.

In chilled iron the factors influencing the depth and quality of the chill are pouring temperature and percentages of silicon, sulphur, phosphorus and total carbon.

The higher the pouring temperature the deeper the chill. A table showing the relation between the per cent silicon and the depth of chill is given. Sulphur causes a brittle chill and is undesirable. Phosphorus injures the strength of chill and causes a sharp line between the white and gray portions. Manganese increases the hardness of the chill and its resistance to heat strains.

The grain structure and porosity depend on the size and percentage of the graphite. Practical rules for geting close-grained, dense iron are given.

Shrinkage.

The term shrinkage includes contraction of the fluid mass or shrinkage and contraction of the solid mass or contraction.

The mechanism of fluid contraction is not well understood. It is less the greater the amount of graphite. The tendency to form shrink holes bears little relation to chemical composition but varies in different brands of iron.

Shrinkage curves showing the manner in which the solid mass contracts are given. The first expansion is due to the separation of graphite. The second expansion is due to the solidification of the phosphide eutectic. The third expansion is probably due to the change of the iron from the *alpha* to *gamma* form. Rules for obtaining minimum shrinkage are given.

Fusibility of Cast Iron.

The fusibility of cast iron depends primarily on combined carbon, and to a less extent, on the phosphorus. Graphite affects the melting point only in so far as it dissolves in the iron at temperatures below the melting point. A diagram and table are given showing the experimental results of Dr. Moldenke.

Fluidity is determined by per cent silicon, per cent phosphorus, freedom from dissolved oxide, and temperature above the freezing point. Practical rules for obtaining fluid iron are given.

SAND FOR "WHAT AILS YOU," OR FOR THE FOUNDRY—ADDRESS ELMER KANAVEL

Resistance to Heat.

The factors affecting resistance to heat are, per cent phosphorus, sulphur and combined carbon, and the density or closeness of grain.

Cast iron undergoes a permanent

JOHN HILL, THE "LARGEST" FOUNDRY SUPPLY MAN IN THE WORLD

expansion on repeated heatings. It may increase as much as 46 per cent by volume. The strength is decreased proportionately. A minimum temperature of 1,200 degrees Fahr. is necessary. The growth is favored by the presence of graphite and silicon. This growth is probably connected with the change from the *alpha* to the *gamma* state taking place at about 1,300 degrees Fahr.

A summary of published statements regarding the proper composition for castings exposed to high temperatures is given.

Of the electrical properties of cast iron, permeability only is of importance. Some typical permeability curves are shown. The effects of the various elements on permeability are shown diagramatically. Practical rules for obtaining high permeability iron are given.

The factors influencing the resistance of cast iron to corrosion are poorly understood. A summary of published information along this line is given. Practical rules for obtaining castings resistant to corrosion are given.

Two classes of castings subject to wear are typified by a grinding roll and a brake shoe. Practical rules are given for obtaining resistance to wear.

There is no data as to the relation

E. D. Frohman and Some of His Friends who Go Gunning for Orders in the Foundry Trade

Abrasive Material Salesmen—H. A. Eaton, G. B. Rogers, O. C. Dobson, G. B. Kelly, C. D. Sargent and F. B. Jacobs

The Three Musketeers—W. H. McFadden, Major Joseph T. Speer and J. S. Seaman

W. H. Taylor in a Contemplative Mood

U. E. Kanavel, C. H. Cotton, H. A. Carpenter and E. A. Pridmore

between the composition of cast iron and its co-efficient of friction.

Defects in Castings.

Blow-holes may be caused by oxidized metal or by excess of sulphur. Dirty castings may be due to high sulphur, kish or segregated graphite, or oxidized metal. Porosity is usually caused by kish. Pin holes are often due to excessive sulphur. Segregation is the greatest in the case of high phosphorus and high sulphur iron.

White spots in the interior of castings are usually due to the iron boiling in the bottom of the cupola. Shrinkage strains may be aggravated by high sulphur. High phosphorus improves the surface or skin of castings and high manganese will cause the sand to peel readily.

Thursday Morning.

"The Shockless Jarring Machine," published in full in THE FOUNDRY, May, 1910, was presented in abstract by Wilfred Lewis, of the Tabor Mfg. Co., Philadelphia. E. H. Mumford, of the Mumford Molding Machine Co., New York, in his discussion, stated that the address contained assumptions, and a theory of the action of jolt ramming machines upon the sand, which are disputable. Continuing, he said: "Mr. Lewis treats the compacting of sand by jolt ramming machines as occurring uniformly and simultaneously throughout the mass. Last October, before the Philadelphia Foundrymen's Association, I called attention to the fact that a zone of proper mold density rises gradually from approximately horizontal joint and pattern surfaces until it nearly reaches the top. Practically, as well as theoretically, it never does reach the actual top in the time in which the rest of the mold becomes hard enough, and the extreme upper layer must be hand-rammed unless excess sand is used and struck-off, in which case the unrammed upper layer is in this excess.

"Were this not true, the many experiments which have been made in ramming molds by dropping sand in cartridges, would have borne fruit. If it were true, as Mr. Lewis says, that 'The longer the stroke the greater the efficiency,' then a single long stroke of 30 x 2½ inches equals 6 feet 3 inches, should ram a mold better than 30 strokes of 2½ inches each."

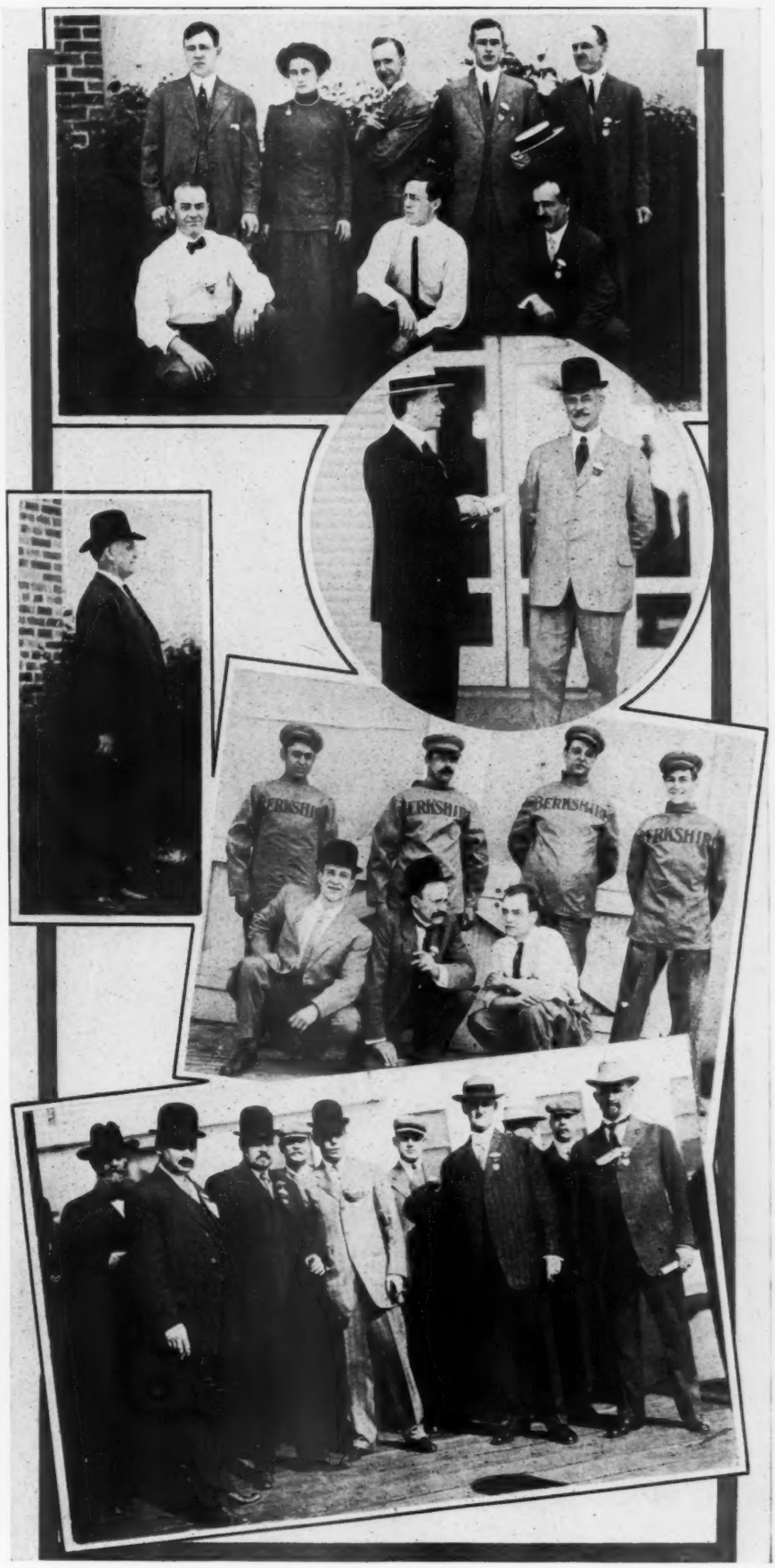
Mr. Mumford added that a single fall of many times this height will not compact the upper regions of a relatively deep mold for the reason that the lower regions have not been set by previous blows to a rigidity able to transmit the anvil effect. Fur-

thermore, he ventured the opinion that only the lowest sand gets the effect of the quick stop or high rate of change in velocity, while the uppermost sand lands so gently on the partly rammed sand below as to confute the hypothesis that ramming proceeds uniformly at all depths. The jolt ramming of sand, he believed, is a progressive process, in which the first impact rams the sand next to the rigid horizontal planes to the maximum density possible for the machine, matchboard and patterns used, the next impact affecting the sand immediately above through the medium of the sand already rammed, and so on, to the top of the mold in gradually diminishing density. The inequality of the density of the sand at the bottom and the top, practically infinite at the first impact, diminishes as the zone of hard sand rises toward the top.

Further discussing Mr. Lewis' paper, in which jolt ramming machines are defined as "Capable of ramming any mold, large or small, in a minute or less time," it was stated that this would lead to the mistaken idea that the size, or rather the depth of a mold is immaterial to a machine of high capacity. He then told of a 16-inch machine which rammed a 10-inch barred green sand cope with 20 blows in 10 seconds, and required a minute and one-half to ram an ingot mold core 6 feet deep, with 190 blows.

Damage by Shock.

Mr. Mumford was also of the opinion that the damage done by shock or jarring of the foundry floor by jolt ramming machines was exaggerated by Mr. Lewis. He stated that a great deal depends upon the nature of the work near the machine, and that heavy, hanging green sand cores should not be placed near jolt ramming operations, especially on swampy ground. Discussing the assumption that "The weight of the anvil is generally limited to the weight of the loaded table," Mr. Mumford contended that anvils constructed of iron and concrete are quite commonly three times, and sometimes seven times the weight of the maximum loaded table, which means that the anvils are from six to at least ten times the weight of average loaded tables. In a table giving the ratio of anvil to loaded table it was contended that where the anvil was ten times the weight of the loaded table the efficiency of the machine is 81 per cent, and this was stated to be occasional practice under the average load. With an anvil six times the



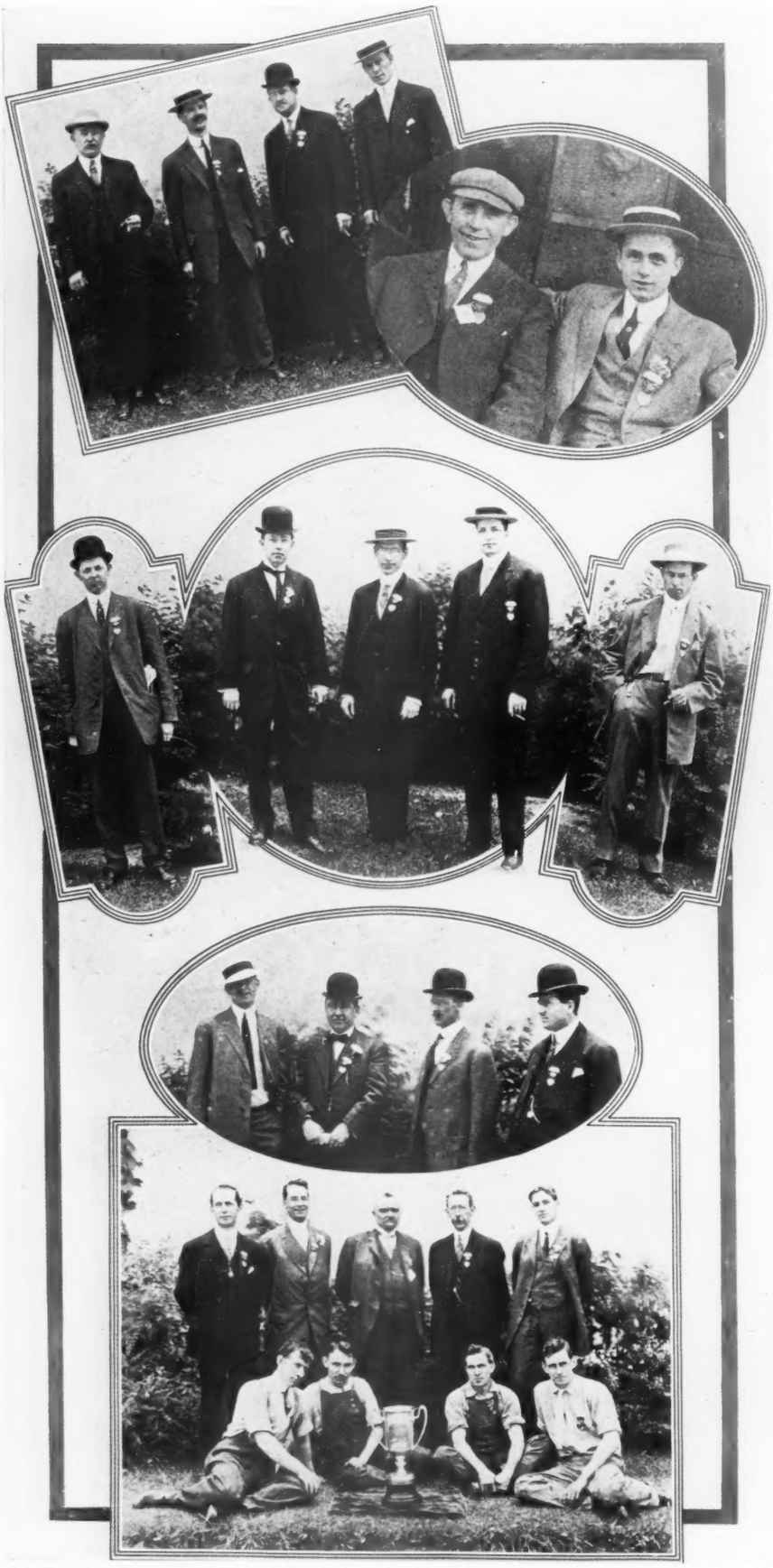
E. J. Woodison and W. B. Howard with Their Assistants at the Show

John Hill Obliges the Photographer by Assuming a Characteristic Pose

Ellsworth M. Taylor Talking Costs to Sam T. Johnston

J. N., J. R. and C. F. Battenfeld, with Paul Battenfeld in Uniform at the Right

Part of the Detroit Local Committee



GEORGE W. MOORE, I. F. KREMER, A. W. MOYER AND HAROLD CHRISTESON, WHO CAME FROM PHILADELPHIA TO SEE THE SHOW

W. M. FITZPATRICK, OF THE S. OBERMAYER CO., AND HIS SON, W. H. FITZPATRICK, OF THE DETROIT FOUNDRY SUPPLY CO.

C. R. GRAHAM, WHO CAME OVER 2,000 MILES TO ATTEND THE CONVENTION

THE PIG IRON TRIO—H. WILSON, H. B. B. YERGASON AND R. W. CLARK

W. S. GREEN

W. H. MAXWELL, I. L. KELLY, W. H. ARMSTRONG AND JAMES MORAN

THE WINNERS OF THE FOUNDRY CUP AWARDED FOR THE BEST OPERATING EXHIBIT

weight of the loaded table, the efficiency of the machine is 73 per cent, which is given as the occasional practice under maximum load.

On the subject of loading it was pointed out that not one load in a hundred placed by the crane on the table of a jolt ramming machine is balanced over the plunger. The centers of gravity of sand molds are rarely in the vertical center lines of the flasks, and it is practically impossible to balance them on the machine tables by the eye.

Reply by Wilfred Lewis.

Wilfred Lewis replied to this discussion, in part, as follows:

"It has been said that I treat the compacting of sand by jolt ramming machines as occurring uniformly and simultaneously throughout the mass, whereas in the second paragraph of my paper, I say, referring to this method of ramming: 'The sand is rammed as it should be, densest at the surface of the pattern and of decreasing density above, thus favoring the escape of gases when the mold is poured.' I never had any other idea about it, and never met anyone who pretended to think that jar ramming formed a crust on top of a mold while the sand beneath was nice and soft. There is nothing in my paper to indicate in any way that my understanding of the process is at all different from the common understanding of it as set forth by my critic. Nor does the acceptance of this understanding affect my contention that the longer the stroke the greater the efficiency. The ramming effect referred to in my paper is the kinetic energy given out by a change in velocity due to impact, and utilized more or less in compacting the sand.

"The progressive nature of jar ramming from the bottom up, is, I believe, self-evident, but the relative density of different parts of a mold can never be more than the relative weights of different parts per cubic foot, and very far from infinite at any time. If it be true that the density of sand is increased 25 to 30 per cent by ramming, it can hardly be true that the difference in density of the sand at top and bottom of the mold is practically infinite at the first impact.

"As to the change in velocity of the table at the instant of impact, I mean, of course, the change in velocity during that very minute fraction of a second while the pressure of impact exceeds the static load. I do not mean the rate of change in velocity at the instant of impact, be-

cause that rate does not hold throughout the duration of contact, and it has very little to do with the final result.

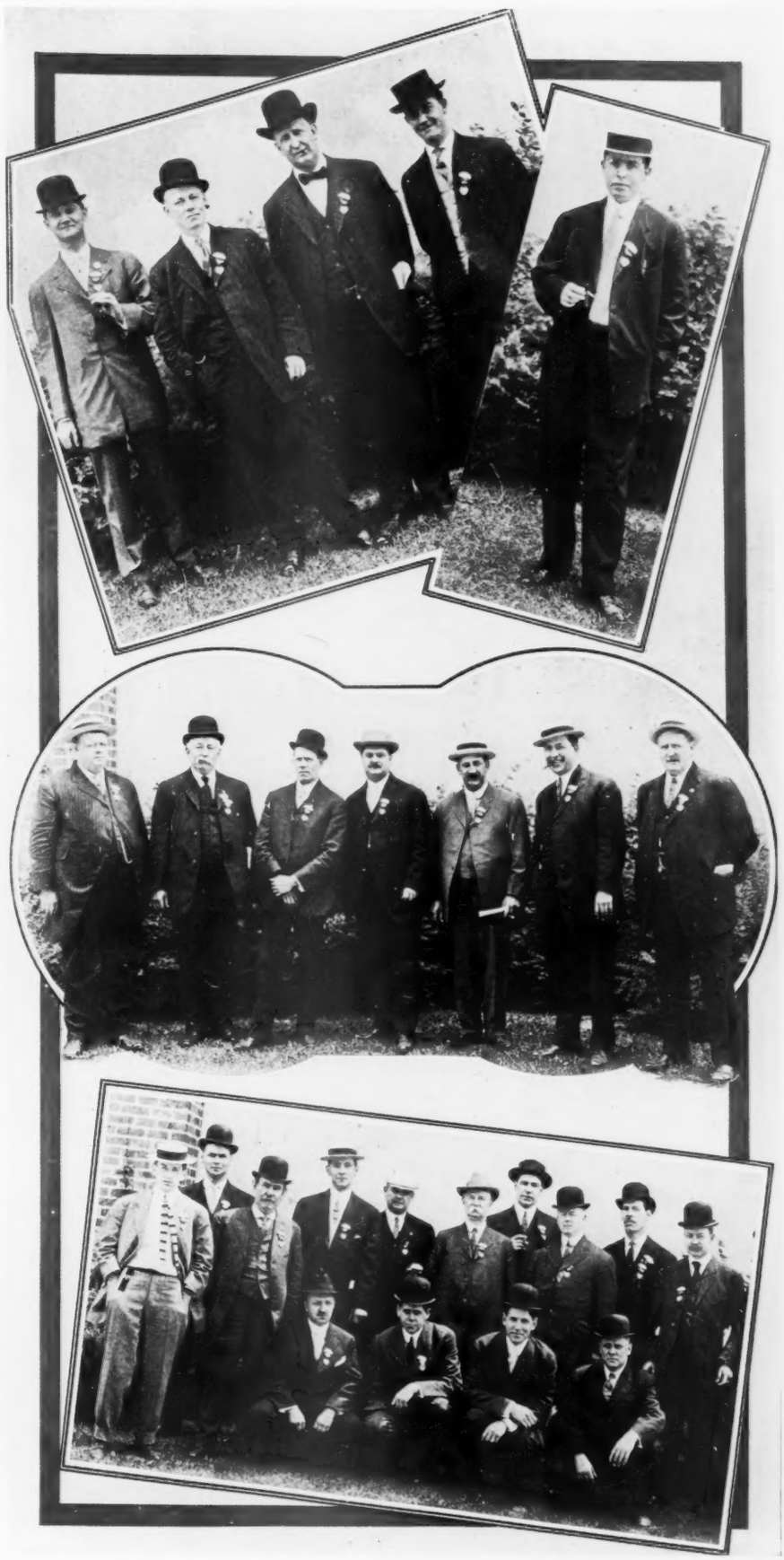
"In regard to the weight of anvil being generally limited to the weight of the loaded table, I would say that this conclusion was reached from a number of observations, and confirmed indirectly by the same authority who now disputes it. I know there is some prejudice against the use of springs, founded chiefly upon ignorance of the duty they should be made to perform. I have seen a great many springs which failed to act as intended and sometimes this has been due to the use of wrought iron or brass instead of high carbon spring steel properly tempered; but when good material is employed, I have seldom known a spring to fail except from bad design, and good steel springs, within certain well defined limits, I believe to be as reliable as any other piece of mechanism. The railroads are the largest consumers of spring steel. They specify the working stresses found to be safe and by keeping well within their limits, the uncertainty about the action of steel springs may be dismissed as no greater than that attached to any other element of machine construction.

"Of course, it is important to have the load central on any jarring machine and since there is no difficulty about locating it in that position, I will not take up your time in considering the effect of eccentric loads. Suffice it to say, therefore, that a reasonable amount of displacement does not appreciably affect the action of the shockless machine."

Discussion by Mr. Outerbridge.

A. E. Outerbridge Jr. presented a written discussion of this subject, which is, in part, as follows:

"In the foundry of Wm. Sellers & Co., Inc., Philadelphia, with which the writer is connected, a jarring machine made by the Tabor Mfg. Co. negotiates flasks 80 x 70 inches and 40 inches deep in the drag and 16 inches deep in the cope. The live heads for several large and powerful lathes have been made on this machine in this flask, which contained 120 cubic feet of sand, the weight of the sand and flask being 16,800 pounds. The weight of the casting is about 9,000 pounds. Machine uprights have also been made on this machine in flasks 140 x 50 inches and 38 inches deep in the drag, and 10 inches deep in the cope. This flask contains 129 cubic feet of sand; the sand and flask together weigh 20,640 pounds. These castings, being of comparatively thin



A Delegation from Cincinnati, Consisting of M. Z. Fox, J. M. Glass, John Hill and William Oberhelman

"Jimmie" Campbell was Strong on Shop Furniture Talk

D. F. Egan, J. B. Jones, Henry Barton, E. A. Pridmore, R. E. Turnbull, W. W. Miller and W. H. Parry

Part of the Pittsburg Delegation, that Landed the 1911 Convention

GEORGE H. WADSWORTH GIVING W. B. HOWARD AND W. C. SLY A FEW INSTRUCTIONS IN CORE MACHINE WORK

"FATHER" MCFADDEN AND HIS 28 ADOPTED DAUGHTERS

DR. MOLDENKE AND MAJOR SPEER AS THEY APPEARED AFTER THE LATTER RELATED ONE OF HIS FAMOUS "LIFE ON THE FARM" STORIES

MRS. K. B. BRUNDAGE, WHO HAD CHARGE OF THE REGISTRATION

F. N. PERKINS AND HIS AIDES, FROM FREEPORT, ILL.

section, weigh about 4,500 pounds each.

"Apart from the reduction in cost of molding these large castings on the jarring machine there is a great advantage in the more uniform weight of duplicate castings and in the more uniform distribution of the sand, the absence of spongy spots and hard spots, inseparable from hand ramming, tending to insure good castings.

"The chief, if not the only objection, to the operation of this machine in the foundry is the 'earthquake' tending to cause sand to drop in contiguous molds on the floor, and in order to overcome this, arrangements are now being made to adapt the shockless principle to the jarring machines already installed. When this has been accomplished it is believed that green sand molds with large overhanging portions can be safely made on the floor alongside of the shockless jarring machine.

"The writer was present at a recent test of a combination roll-over jarring machine at the works of the Tabor Mfg. Co., and saw a deep pattern rammed up in a flask 23 x 32 inches and 13 inches deep, weighing about 1,000 pounds, on the third floor of an old building, without any perceptible shock, and with no more pulsation in the floor than might be expected from the action of an ordinary squeezer."

P. J. Murphy asked how the anvil would be arranged for different jobs, that is, for one, two or three tons. Mr. Lewis replied that if the loaded table weighs three tons and the anvil three tons, the two would move together the same distance. If the weight of the table were not so great the anvil would rise 1 inch and the table 3 inches.

Premium or Bonus.

A paper entitled "Reward—Premium or Bonus," by W. J. Power, was next read and is presented herewith:

Discipline, organization, standardization of conditions and operations, are elements of modern business, which, while greatly aiding to stimulate and increase production, inure for the most part to the benefit of the employer.

They are as essential to progress and success as is the establishment of reward or premium—they are in fact the premises or foundation of the intelligent distribution of premium.

Premium should be the last step undertaken in the betterment of a plant. It is the recognition of a workman's ability—of his willing and active attitude of mind and body—to avail himself of the improved conditions which the above mentioned elements have perfected. Without dis-

cipline, organization and standardization, premium or reward will be predicated on a very doubtful base, and will have but a small proportion of its efficacy which would obtain were it based on these cornerstones; and it is equally true that these important elements will be deprived of much of their value unless the workman is the beneficiary of some reward which will induce him to give full play to their helpful influences.

Reward for his effort, and for the proper economy of his time, in reality starts the worker in a business of his own—it opens for him accounts of profit and loss—it appeals directly to his purse.

Time, the most precious of all earthly gifts, is coined into money, or is lost, entirely at the option of the workman.

The tremendous difference between a man thoroughly interested in earning a reward, planning and scheming to make the reward as great as possible, and a man plodding along on a fixed day or hourly wage, can be appreciated by those only who have daily mingled with each class of men.

It can be positively stated that man or foreman will accomplish two-thirds more work than he will on a fixed day rate without premium. There are thousands of examples to corroborate this statement.

It can also be shown with certainty, that a workman's development in his craft is much greater under a reward system than under a fixed pay system—that his originality and inventive genius are inspired very considerably more, that his permanence as an employe is enhanced markedly.

Premium in the Foundry.

There is perhaps no other craft to which reward for effort can be so appropriately applied as to that of the molder. As a rule his work is one round of physical exertion. The quality and amount of his work are more dependent on mental and muscular ability than on the absolute capacity of a machine or apparatus.

The result is that in every day-rate shop or fixed-rate foundry ever visited by the author, a very restful and leisurely gait was noticeable—while a close check of the actual hours showed from 6 to 6½ hours per day.

The payment of premium based on proper standards will bring this amount up to an average of eight hours at a much more intensive gait, and with proper inspection will improve the quality of the work done. This statement is also founded on the experiences of the author and of others.

Volumes could be written in elaboration of the advantages of a reward plan of paying labor, when such a plan of reward is consequent upon the successful operation of the other vital features of management.

The practical results of a co-operative effort between employer and employe, the former paving the road well for the latter, should be at least a net gain in cost to the former of 2[illegible] per cent and an increment in earnings of 20 per cent to the latter.

"Rejected Castings in Steel Foun-

DAVID MCLAIN, DAVID C. WILSON, BENJAMIN OGDEN AND H. E. BERLINER

WILFRED LEWIS, WINNER OF THE FOUNDRY CUP FOR THE BEST OPERATING EXHIBIT

T. E. MALONE AND J. S. MCCORMICK WITH A PARTY OF FRIENDS

W. W. SLY, THE PATRIARCH OF THE FOUNDRY EQUIPMENT FRATERNITY

A DELEGATION FROM NEW YORK—JESSE J. BOWEN, FOSTER I. HALL, HARRY B. GATES AND JOHN C. PANGBORN

dries," by S. D. I. Emerson, was then presented, and is, in full, as follows:

The purpose of this paper is to show how the principles of efficiency may be applied with profit to the subject of rejected castings in steel foundries.

High manufacturing efficiency, resulting in minimum unit cost, has of late years received much attention, with the general understanding that new and improved machinery and more strenuous effort, were the means best calculated to bring about the desired result.

Now we are beginning to realize that efficiency means something more, something different from this former conception. The new school defines efficiency as "the elimination of unnecessary wastes," so that with less effort, less power, less machinery, better results may be obtained.

In most manufacturing plants, there are many wastes, waste in power generation and use, waste in machinery installation, waste of materials, large waste of effort and yet larger waste of time.

In foundries, defective or rejected castings constitute an element of loss, which, like the poor, is always with us, so that it may be profitable to consider how the principles of efficiency can be applied to this problem.

Of these principles, that of "accurate and prompt records," is the most important, as it is absolutely essential to the proper application of further principles and methods.

Practical foundrymen, until within the last few years, did not fully realize the importance of accurate records as to foundry rejections. Inspection was less severe, customers accepted without question the shipments made, the loss due to rejections was an undertermined quantity and generally assumed to be less than it actually was.

Now fortunately, chartered accountants, coming to us from England, have revolutionized former methods of cost accounting and have demonstrated the value of accurate detailed records to those who employed them, but the rank and file are still disposed to make but little practical use of the new knowledge, so that in many large steel foundries, the records kept, lack vitality.

Records of Rejection.

In some foundries, records as to rejections are not tabulated, in others, the average percentage of rejections is shown on the monthly statement, in those larger foundries, having a modern accounting department, detailed statements are elaborated and sent to the head office, usually from two to three weeks after the expiration of the working period they cover.

Records handled in this way are of some value from a cost accounting point of view, but as a method of promoting efficiency, as a vital means of reducing loss, they are fairly barren of results.

To ascertain on March 15, that there were 12 per cent rejections on an order complete and shipped on Feb. 20, is not what is meant by "accurate and prompt records."

The records should be kept and tabulated as to cause, location, number of castings, number of heat, as to each molder or floor gang, with percentage of loss for each working day or shift, and statements made to those responsible for the foundry work within a few hours after the pour, if possible before starting the next day's work.

Organization and Rewards.

When a system for obtaining accurate records and placing them in the hands of those in charge of the work has been devised and put in practice, the next step is to make them effective as a means of improvement, which brings us to the application of two further principles of efficiency: (1) Organization and discipline; (2) Efficiency rewards.

In those smaller foundries, where it

GEORGE R. RAYNER, PRESIDENT OF THE FOUNDRY AND MANUFACTURERS' SUPPLY ASSOCIATION

is customary for molders to do all of the work, molding, moving molds, and pouring the metal, where workmen can, with fairness, be paid by the piece, for good castings only, accurate information is well nigh sufficient in order to obtain good results, but in the larger steel foundries, responsibility does not attach to the individual in the same degree; the molder will object to losing his pay on account of defects for which he may not be responsible. If piece rates are imposed they must be, either on the basis of molds made, without regard to loss, or the rates must be high enough to cover the average of such loss, if charged to the workman. In either case the loss will ultimately be carried by the employer.

In some foundries it will be found productive of good results to bonus foremen on the basis of percentage of rejected castings, paying the molding gang on the standard time basis, for molds made. Where the time of the foreman is fully occupied by other duties, a rejection department should be organized, with one or more thoroughly competent men, whose sole duty should consist in reducing the percentage of rejections. With an initial low base wage, two-thirds of the pay of these men should be dependent on the results achieved.

Average Losses.

Many steel foundries have a monthly output of from 3,000 to 5,000 tons of good castings. Most of them have an average loss due to rejected castings of 8 to 9 per cent. The actual money loss varies of course with the cost of materials and labor. The best accountants, with whom I am acquainted, estimate the present loss on rejections at $35 per ton of 2,000 pounds. I myself prefer to figure it at $30 per ton or $1.50 per 100 pounds.

With a good output of 5,000 tons per month and 8 per cent rejections, we have a loss of $13,000 per month, not including loss of profits due to reduced output.

Most of the work in connection with this proposed application of efficiency principles to the subject of rejections is already being done in the larger foundries. Rigorous inspection is imposed by contract agreements; considerable clerical work is now devoted to this matter, tabulations are compiled monthly from daily records, etc.

Additions to the clerical force are scarcely needed, at most, one additional clerk for a 5,000-ton foundry.

Assuming that for such a plant it would be necessary to organize a special department with three extra men the cost should not exceed $600 per month, while I am confident, that where rejections now average 8 per cent, they would be reduced by these methods to 5 per cent, the net gain aggregating more than $50,000 per annum. This assumption is based on practical experience in some of the largest steel foundries in the country.

Causes of Rejection.

In a steel foundry where the writer had an opportunity to study conditions thoroughly, we recorded, during a full year's operations, 63 different causes of rejection, many of them, of course, accidental and of infrequent occurrence.

Twelve principal causes were responsible for more than 90 per cent of rejections, 75 per cent were covered by 6 causes, to one cause, cracks, about 50 per cent of all rejections were attributable. The records were elaborated as to the 12 principal causes, which at once brought to light some interesting facts.

It had been assumed that cracks were largely due to metallurgical difficulties, but our tables showed them to bear little or no relation to heats, but that they occurred principally as to certain castings, the percentage being very much greater on new work than on orders that had been running for several weeks. From this we concluded that they were mechanically avoidable.

As to a certain casting on which five floors had steady work, cracks

having averaged 17.8 per cent for 10 consecutive heats, a careful investigation was made, location of cracks noted on castings, and mechanical means were taken to eliminate them. Records as to each day's work were given to the three foremen in charge of the floors.

The effect was immediate, in a few days, cracks were reduced to an average of less than 2 per cent, the total of all rejections averaging less than 3 per cent for 30 consecutive heats. The foreman with the best record showed an average of 1.7 per cent of total rejections.

Other Causes of Rejected Castings.

One of our 12 principal causes was "cope raise" with half of 1 per cent rejections charged to it. On investigation it was found that cope raises were due to loose cross bars in flasks. New bars were gradually substituted and old ones were repaired. At the end of 60 days cope raises had fallen to an average for the month of less than one one-hundredth of 1 per cent.

Second, after cracks came "dirt in mold," averaging over 1 per cent. This was run down and found to be most prevalent in certain molds which were transferred to pouring floors on flat cars. The handling of these cars was given special attention, and "dirt" fell at once to fourth place on our list, with 0.52 per cent.

The records as tabulated revealed enormous differences in percentage of rejections, first as to cause, second as to castings, third as to foremen, and fourth as to molding gang.

Rejections under one foreman were more than twice the average of the plant. Under his successor they immediately dropped 50 per cent.

The few examples mentioned indicate in a general way the methods attempted, records were obtained and the work carried on without special organization and without any scheme of bonus to men or foremen as to rejections. The whole subject received only intermittent attention.

Conclusion.

At the end of a year's study we reached the following conclusions:

In steel foundries, rejections are principally due to accidents, or to inefficient methods in core or molding departments.

Ninety per cent of rejections are mechanically avoidable, without reference to metallurgical difficulties.

With adequate record, systematic and continual attention, rejections can be reduced to an average of 3 per cent.

In order to secure the continual attention required, a separate organization with pay largely dependent on results is most effective.

Discussion of Rejected Castings.

In the ensuing discussion the question was raised as to the average of rejections of steel castings, one member stating that his foundry had shown an average of only 2 per cent over a period of three years. R. A. Bull, superintendent of the Commonwealth Steel Co., Granite City, Ill., believed that 6 per cent would be nearer the general average. Joseph J. Wilson, Detroit, was of the opinion that much depends upon where the line of rejected material is drawn, as some firms accept what others reject, and therefore the percentage of rejections might be three, five or ten, according to the strictness of the requirements.

Industrial Education.

Paul Kreutzpointner, Altoona, Pa., presented the report of the committee on industrial education, of which he is chairman and the sole member. He emphasized the necessity of industries co-operating with schools, and referred to the wave of interest in

ROBERT B. THOMSON, PRESIDENT OF THE ASSOCIATED FOUNDRY FOREMEN

industrial training now passing over the country. The following course of study in the shop school was recommended:

English in connection with reading from technical and trade journals on topics of general interest and pertaining to the occupation of the pupils. Geography, co-related questions of the localities where our principal resources are found, the location of our land and water routes. The extent of country covered by our industries and to what extent the physical condition favors or hinders the development of industries and agricultural expansion.

Exercises in composition, using as subjects such historical events or geographical facts or objects of natural history which are closely related with the practical necessities of the pupils. In all this work good penmanship is to be urged. Instruction in natural history should include a review of animal and plant life and individual animals, plants and minerals which furnish the raw material for the various trades and industries the pupils are engaged in.

Elementary instructions and demonstrations of the properties of bodies, their weight and motions, the nature of the atmosphere, heat, light—magnetism and electricity. The most important phenomena and the use of the laws of nature in the service of mankind. Drawing, freehand and mechanical, should of necessity form an important part of the instruction. The school shop, in order to be thoroughly effective, should be well supplied with machinery and appliances as well as illustrations of interesting subjects relative to the development of our country and to the industries of the locality where the school is located. There should be a museum containing samples of raw materials and specimens of work in its various stages of production. Likewise specimens of work spoiled through carelessness or inefficiency, these specimens to be used as object lessons, weaving in with their use attractive bits of useful information such as would not be comprehended by the pupils if given to them separately and in the abstract. In this way we are able to stimulate the imagination. Because of this lack of imagination, pupils leaving the public school at 14, with perhaps a sixth or seventh grade education, soon get weary and tired of any instruction presented to them in a continuous and abstract way. This is the rock the purely academically trained teacher is liable to get wrecked upon whenever he attempts to instruct in a shop or continuation school or evening school.

Even after the age of 16, great care must be taken not to overstimulate and fatigue the assimilative powers of the young people. The desire for results, both with the teacher and employer, is so great and urgent that there is always danger of forcing the mind, and then there is disappointment. In most cases of that kind it is unjust to blame it upon the unwillingness of the pupils when the real cause is either improper method or lack of preparation. With all this school work there should be a persistent effort to arouse the attention of the young people to the close connection of certain public measures or events taking place with the welfare of the people and the prosperity of our industries and agriculture.

That a broader conception of the economic and social value of industrial education is already dawning in the minds of progressive men is shown by the fact that your chairman has received three requests, two of them from the heads of state educational institutions, to assist them in the preparation of arguments to show the intimate relation between the industrial educational movement, labor, capital, etc., and the influence of this movement upon our industrial standing and social and economic welfare.

Albert S. Braughton commended the work of the committee and spoke of the desire of his firm to receive the literature on the subject of in-

dustrial education published by the American Foundrymen's Association.

Thursday Afternoon.

Dr. Richard Moldenke presented the following report on specifications for foundry coke, with suggestions for a standard to be adopted by the trade:

The subject of specifications for foundry coke has been long agitated, but very little has been so far accomplished, and this is probably because we have been going through just such a change in practice in our coke as we have in our pig irons since more liberal and yet more exact views have prevailed. The appearance of a coke no longer carries the weight it formerly did, and all that is now asked is that it melts iron properly, and has a composition to do this without serious detriment to the metal.

This change in practice has undoubtedly been the result of the educational efforts of the by-product coke manufacturers, and as it has meant the saving of much money formerly spent in freights, the foundry industry has been the gainer in every direction on the coke item.

There is still much to be learned by the foundryman regarding the fuel he uses for melting purposes. Too often the blame for poor results is placed on the coke, when the real trouble lies in his melting practice. So that there may be no doubt about the fuel end, it is highly advisable that a good and yet liberal set of specifications for foundry coke be drawn up, so that coke bought under them may assure the foundryman that on this item of his daily work he may be reasonably safe. If then he runs into trouble, he will have eliminated the coke from his study of the difficulty.

Cellular Structure.

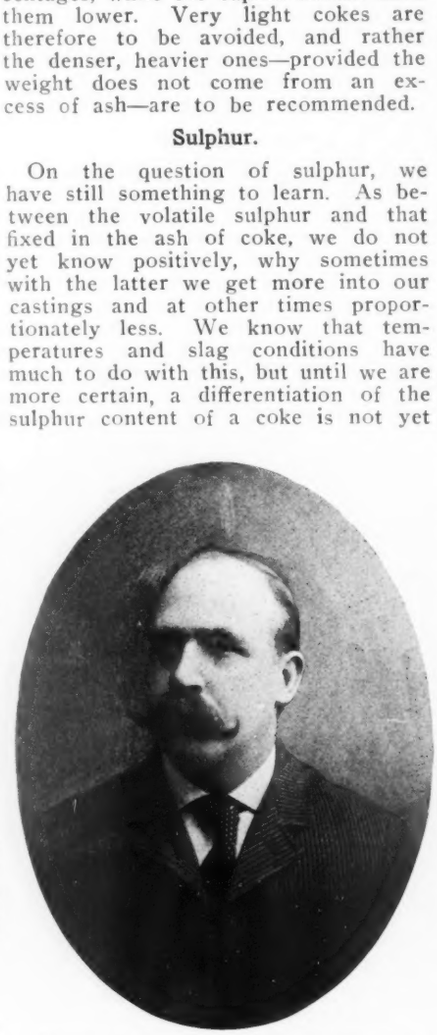
There are many points which have a bearing on the value of a coke and yet cannot well be added to such specifications. Thus, the cellular structure is an important factor on the working of the coke in the cupola. It must be remembered that in contradistinction to blast furnace practice, where there is a reducing atmosphere, in the cupola it is oxidizing. In the blast furnace the cellular structure of the coke should be as great as possible, so that every molecule of oxygen is used up in burning the carbon, and with an excess of incandescent carbon make carbonic oxide gas. This means that the lighter the coke—consistent with its carrying power—and the more porous, the better.

On the other hand, for foundry purposes, it is desirable that coke be burned with a slight excess of oxygen, as in boiler practice, so that as complete a combustion of the fuel as possible may result. That is the gas should be carbonic acid with but little carbonic oxide. Now this can best be accomplished by presenting smaller surfaces to the passing oxygen. For that reason the smooth surfaces of anthracite, with no cellular structure whatever, give a most excellent fuel for the cupola, though coke can be burned faster.

Considering average coke to be 50 per cent cellular structure, the blast furnace can take care of higher percentages, while the cupola should have them lower. Very light cokes are therefore to be avoided, and rather the denser, heavier ones—provided the weight does not come from an excess of ash—are to be recommended.

Sulphur.

On the question of sulphur, we have still something to learn. As between the volatile sulphur and that fixed in the ash of coke, we do not yet know positively, why sometimes with the latter we get more into our castings and at other times proportionately less. We know that temperatures and slag conditions have much to do with this, but until we are more certain, a differentiation of the sulphur content of a coke is not yet



HUGH MCPHEE, SECRETARY OF THE ASSOCIATED FOUNDRY FOREMEN

safe, the idea being that the dangerous portion of the sulphur only need be kept down.

Further, there is no doubt but that we will eventually have some means of reducing the sulphur in our molten iron before pouring, and then sulphur in coke will lose some of its terrors.

The following suggestions are presented for specifications for foundry coke, and the following acknowledgments are made. The limits in composition and the base analyses are suggested by A. W. Belden, coke expert of the U. S. Geological Survey. They are the result of his extended observation with cokes from all the fields of this country. The portion relating to the shatter test comes from the regular practice of the Detroit Solvay Coke plant, Warren S. Blauvelt having kindly sent the writer the specifications on this point.

Premiums.

The subject of premiums for extra good coke as against penalties for running below the mark, has long been advocated by the writer as the only fair way of handling the subject. So long as the limit for rejection is placed at a point which will do no injustice to the producer, he will study to get the best results so that he not only gains financially, but also acquires a reputation for it. Penalizing without giving corresponding premiums for special excellence has always been held as against fundamental law, and where the base analysis has been settled upon, and safe physical tests added to the chemical, the results should be good for consumer and producer alike.

Suggested Coke Specifications.

Coke bought under these specifications should be massive, in large pieces, and as free as possible from black ends and cinder.

SAMPLING.—Each carload, or its equivalent, shall be considered as a unit, and sampled by taking from the exposed surface at least one piece for each ton, and so as to fairly represent the shipment. These samples, properly broken down and ground to the fineness of coarse saw dust, well mixed and dried before analysis, shall be used as a basis for the payment of the shipment. In case of disagreement between buyer and seller, an independent chemist, mutually agreed upon, shall be employed to sample and analyze the coke, the cost to be borne by the party at fault.

BASE ANALYSIS.—The following analysis, representing an average grade of foundry coke, capable of being made in any of the districts supplying foundries, shall be considered the BASE, premiums and penalties to be calculated thereon as determined by the analysis on an agreed base price.

	Per cent.
Volatile matter	1.00
Fixed carbon	85.50
Ash	12.00
Sulphur	1.10

MOISTURE.—Payment shall be made on shipments on the basis of "dry coke." The weight received shall therefore be corrected by deducting the water contained. (Coke producers should add sufficient coke to their tonnage shipments to make up for the water included as shown by their own determinations.)

VOLATILE MATTER.—For every 0.50 per cent, or fraction thereof, above the 1.00 per cent allowed, deduct .. cents from the price. Over 2.50 per cent rejects the shipment, at the option of the purchaser.

FIXED CARBON.—For every 1.00 per cent, or fraction thereof, above 85.50 per cent, add, and for every 1.00 per cent, or fraction thereof, below 85.50 per cent, deduct .. cents. Below 78.50 per cent rejects the shipment at the option of the purchaser.

ASH.—For every 0.50 per cent, or fraction thereof, below 12.00 per cent, add, and for every 0.50 per cent, or fraction thereof, above 12.00 per cent, deduct .. cents from the price. Above 15.00 per cent rejects the shipment at the option of the purchaser.

SULPHUR.—For every 0.10 per cent, or fraction thereof, below 1.10 per cent, add, and for every 0.10 per cent, or fraction thereof, above, deduct .. cents from the price. Above 1.30 per cent rejects the shipment at the option of the purchaser.

SHATTER TEST.—On arrival of the shipment, the coke shall be subjected to a shatter test, as described below. The percentage of breeze thus determined, above 5 per cent of the coke, shall be deducted from the amount of coke to be paid for (after allowing for the water), and paid at breeze prices, previously agreed upon. Above 25 per cent fine coke rejects the shipment at the option of the purchaser. Fine coke shall be coke that passes through a wire screen with square holes 2 inches in the clear.

The apparatus for making the shatter test should be a box capable of holding at least 100 pounds coke, supported with the bottom 6 feet above a cast iron plate. The doors on the bottom of the box shall be so hinged and latched that they will swing freely away when opened, and will not impede the fall of the coke. Boards shall be put around the cast iron plate so that no coke may be lost.

A sample of approximately 50 pounds is taken at random from the car, using a 1¼-inch tine fork, and placed in the box without attempt to arrange it therein. The entire material shall be dropped four times upon the cast iron plate, the small material and the dust being returned with the large coke each time.

After the fourth drop the material is screened as above stated, the screen to be in horizontal position, shaken once only, and no attempt made to put the small pieces through especially.

The coke remaining shall be weighed and the percentage of the fine coke determined.

If the sum of the weight indicates a loss of over 1 per cent, the test shall be rejected and a new one made.

Rejection by reason of failure to pass the shatter test shall not take place until at least two check tests have been made.

Discussion of Coke Specifications.

Warren S. Blauvelt, in discussing the suggested specifications, stated that where deductions are made the concern should be given a percentage of the original price, rather than so many cents per ton. In making tests, he added, there are difficulties which should be understood by both parties to the contract, and one of these is connected with obtaining a representative sample, due to the localization of sulphur in certain portions of the shipment. The shatter test proposed, he believed would very much reduce the coal area that can be drawn upon for foundry coke. Much of the coke now sold to foundries would have to be marketed as domestic coke, and foundry coke would necessarily be higher in price. It was also stated that the question of penalties and bonuses presented many difficulties in case of disagreement over the chemistry of the coke. Unfortunately, foundrymen only have analyses made when they are experiencing difficulties, and it was stated that it was really a question whether the amount of coke used in the ordinary foundry is large enough to warrant analyses of every carload. It was admitted however that the foundries that do analyze their coke regularly, undoubtedly obtain the best material in the market.

T. J. Best said that many foundrymen were of the opinion that coke containing as high as 1 per cent sulphur is not suitable for foundry use. He believed therefore that 1.10 per cent, as given in the suggested specifications, was too high, and preferred 0.80 per cent sulphur.

H. E. Field stated that while he had been favorable to specifications for foundry coke he realized that foundrymen might get into deep water in taking up this question. Moisture, particularly, presents difficulties, as it is impossible to know exactly the condition of the coke at the point of shipment without having a representative on the ground. The present practice is simply to take the weights at the point of shipment and abide by them. He thought the question of volatile matter well covered in the suggested specifications. On ash he would have a bottom limit, as some cokes are too low in ash. Cupola construction and operation are also factors to be considered. He believed the sulphur maximum too high, since most Connellsville coke producers will sell foundry coke on a 90 per cent guarantee. He considered that this problem involved questions to be adjusted between individual buyers and individual sellers, and therefore a broad specification is required, rather than one going into minute detail.

The paper on "Foundry Transportation Methods," by David Gaehr, was read by title. The meeting closed with an interesting address on "Overhead Transportation for the Foundry," by A. W. Moyer, Philadelphia, which was illustrated with lantern slides showing various installations of the Moyer overhead trolley system.

Friday Morning.

The meeting closed with a business session on Friday morning. A resolution providing for the appointment of a program committee of five by the president was adopted. This will relieve the secretary of a large amount of work which he has been compelled to perform in the past. An auditing committee of two was also appointed. A resolution thanking the Michigan State Fair Association for the use of its grounds and buildings for the convention was passed unanimously. Major Joseph T. Speer extended an invitation to the association to hold its next convention in Pittsburg. This was referred to the executive committee, with instructions to meet in 1911 in the Smoky City. It was also announced that Milwaukee, St. Louis, Dayton and Rochester were anxious to obtain future conventions. Arthur T. Waterfall, retiring president, was elected an honorary member of the association.

The following resolution was unanimously adopted:

Whereas, it is unanimously conceded that the Detroit convention has been a perfect success, which success has resulted from the untiring efforts of the Detroit local convention committee, and

Whereas, it is the desire of the American Foundrymen's Association as a whole that the appreciation of the Detroit convention committee should appear on the records of this association, therefore be it

Resolved, that the American Foundrymen's Association tender to the entire Detroit convention committee, chairmen of the various committees, the ladies of the reception committee, who have done so much to entertain the visiting ladies, and succeeded so well, in fact to all those who have worked so faithfully to make the convention the success it has been, their unanimous thanks and deep appreciation.

Election of Officers.

Officers for the ensuing year were elected as follows:

President, Joseph T. Speer, Pittsburg Valve, Foundry & Construction Co., Pittsburg.

Vice Presidents:

First district, F. B. Farnsworth, McLagon Foundry Co., New Haven, Conn.

Second district, Walter Wood, R. D. Wood & Co., Camden, N. J.

Third district, W. A. Bole, Westinghouse Machine Co., East Pittsburg, Pa.

Fourth district, William Gilbert, Buckeye Foundry Co., Cincinnati, O.

Fifth district, J. J. Wilson, General Motors Co., Detroit, Mich.

Sixth district, T. W. Sheriffs, Sheriffs Mfg. Co., Milwaukee, Wis.

Seventh district, Alfred E. Howell, Phillips & Buttorf Mfg. Co., Nashville, Tenn.

Eighth district, A. N. W. Clare, Clare Stove Co., Preston, Ont.

Secretary-treasurer, Richard Moldenke, Watchung, N. J.

The nominating committee consisted of W. H. McFadden, chairman, L. L. Anthes, H. A. Carpenter, Alfred E. Howell and J. J. Wilson.

Entertainment Features.

The entertainment program reflected great credit upon the committee in charge of this feature of the convention. On Monday evening a dinner was tendered the officers of the allied foundrymen's associations and the members of the technical press, at the Hotel Pontchartrain. Walter S. Russel presided. Eugene Smith, in response to a toast on the "Associated Foundry Foremen," spoke as follows:

"The employer is interested in his income, which depends entirely upon his output as compared with the money invested. He depends upon his foundry foreman to keep up his output. He depends upon him for the quality of the output. He depends upon him to overcome the many little difficulties which occur in no other department as in the foundry.

"In most cases the foundry foreman is a man who has not had a technical education, and his only opportunities for advancement have been attained by hard knocks.

"It is fitting that he should gather with his fellow foundry-foremen in social intercourse that he may acquire

(Continued on page 262.)

DETROIT EXHIBIT of FOUNDRY EQUIPMENT

Greatest display of labor-saving devices for foundry use ever made --- Winners of The Foundry cups --- Pictorial review of the exhibits

THE exhibition of foundry supplies and equipment, held in the exposition buildings at the Michigan State Fair Grounds, Detroit, during the week of the convention of the allied foundrymen's association, was of such magnitude as to compare favorably with the greatest industrial shows ever held in this country. The exhibits, which crowded three large buildings and overflowed into a tent, covered a total area of 30,100 square feet, nearly twice the space reserved by manufacturers at any of the previous exhibitions given by the Foundry and Manufacturers' Supply Association. The show was formally opened on Monday morning, June 6, and until the doors were closed on Friday evening, the buildings were constantly crowded with foundrymen, who manifested a lively interest in witnessing the practical demonstrations of the foundry labor-saving devices developed during the last 12 months. The attendance is indicated by the number of admissions, no less than 3,892 tickets having been sold. Many of the local foundries declared half-holidays at various times during the week, to permit their employes to attend the exposition.

The presentation of two silver loving cups by The Foundry for the best still and operating exhibits, aroused great interest among all of the exhibitors, and the announcement of the awards was eagerly anticipated. On Tuesday afternoon the first meeting of the committee on awards, appointed by President F. N. Perkins, and consisting of Henry A. Carpenter, chairman, Stanley G. Flagg Jr., Major Joseph T. Speer, Arthur T. Waterfall and A. E. Howell, was held in the Michigan State building. It was decided to judge the exhibits on a percentage basis, and the points considered were magnitude, general appearance of the display as a whole, novelty, utility, etc. The announcement of the awards was deferred until Tuesday evening, and proved to be one of the features of the subscription dinner given at the Hotel Cadillac by the Foundry and Manufacturers' Supply Association. Arthur T. Waterfall spoke for the committee in the absence of the chairman, Henry A. Carpenter. He explained the method pursued in judging the various exhibits, and said that the displays were first canvassed individually and later they were inspected by the committee in a body. After careful consideration he said that it had been decided to award THE FOUNDRY cup for the best operating exhibit to the Tabor Mfg. Co., Philadelphia, and THE FOUNDRY cup for the best still exhibit to Baird & West, Detroit agents of the Solvay Process Co. A large number of ex-

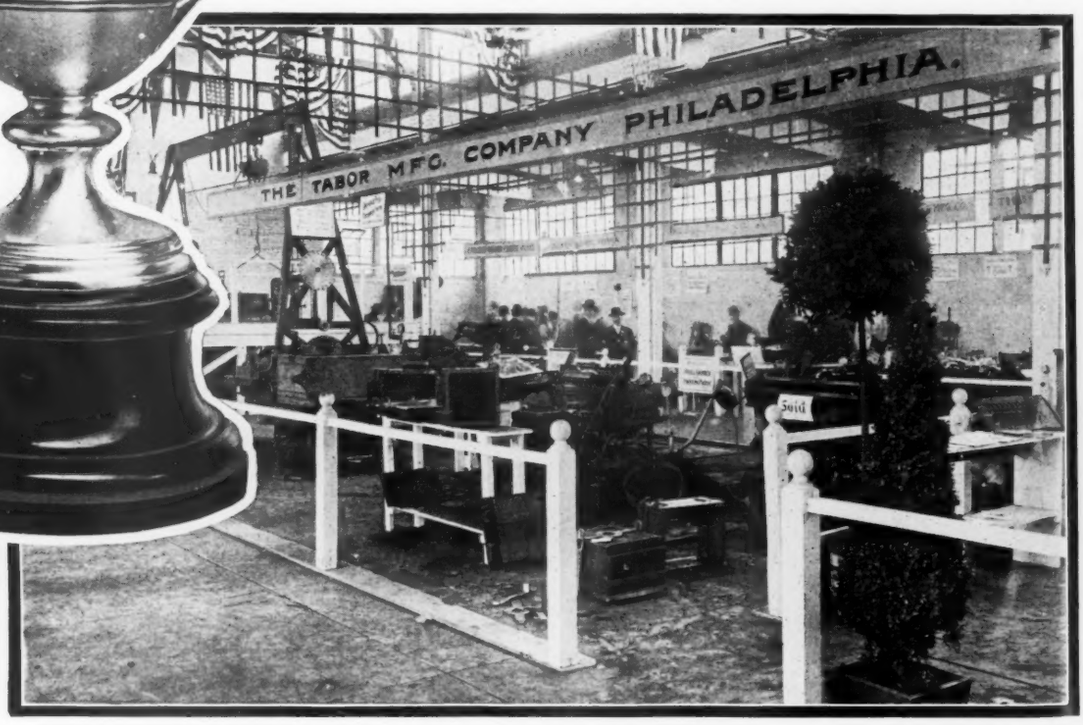


EXHIBIT OF THE TABOR MFG. CO., PHILADELPHIA, WHICH WAS AWARDED *The Foundry* CUP FOR THE BEST OPERATING EXHIBIT

hibitors were given honorable mention, as the members of the committee were of the opinion that these manufacturers were deserving of great credit for the excellence of their displays. As previously announced, THE FOUNDRY will offer similar trophies for the best exhibits at the exposition of foundry supplies and equipment to be held in the future.

This dinner was one of the many enjoyable events of the week. Frederic B. Stevens, Detroit, was toastmaster, and responses were given by F. N. Perkins, Arcade Mfg. Co., Freeport, Ill., president of the Foundry and Manufacturers' Supply Association; H. M. Leland, Cadillac Motor Car Co., Detroit; Stanley G. Flagg, Jr., Stanley G. Flagg & Co., Philadelphia; A. I. Findley, *The Iron Age*; E. H. Mumford, Mumford Molding Machine Co., New York; C. E. Hoyt, Chicago, secretary the Foundry and Manufacturers' Supply Association; J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill., and A. O. Backert, THE FOUNDRY.

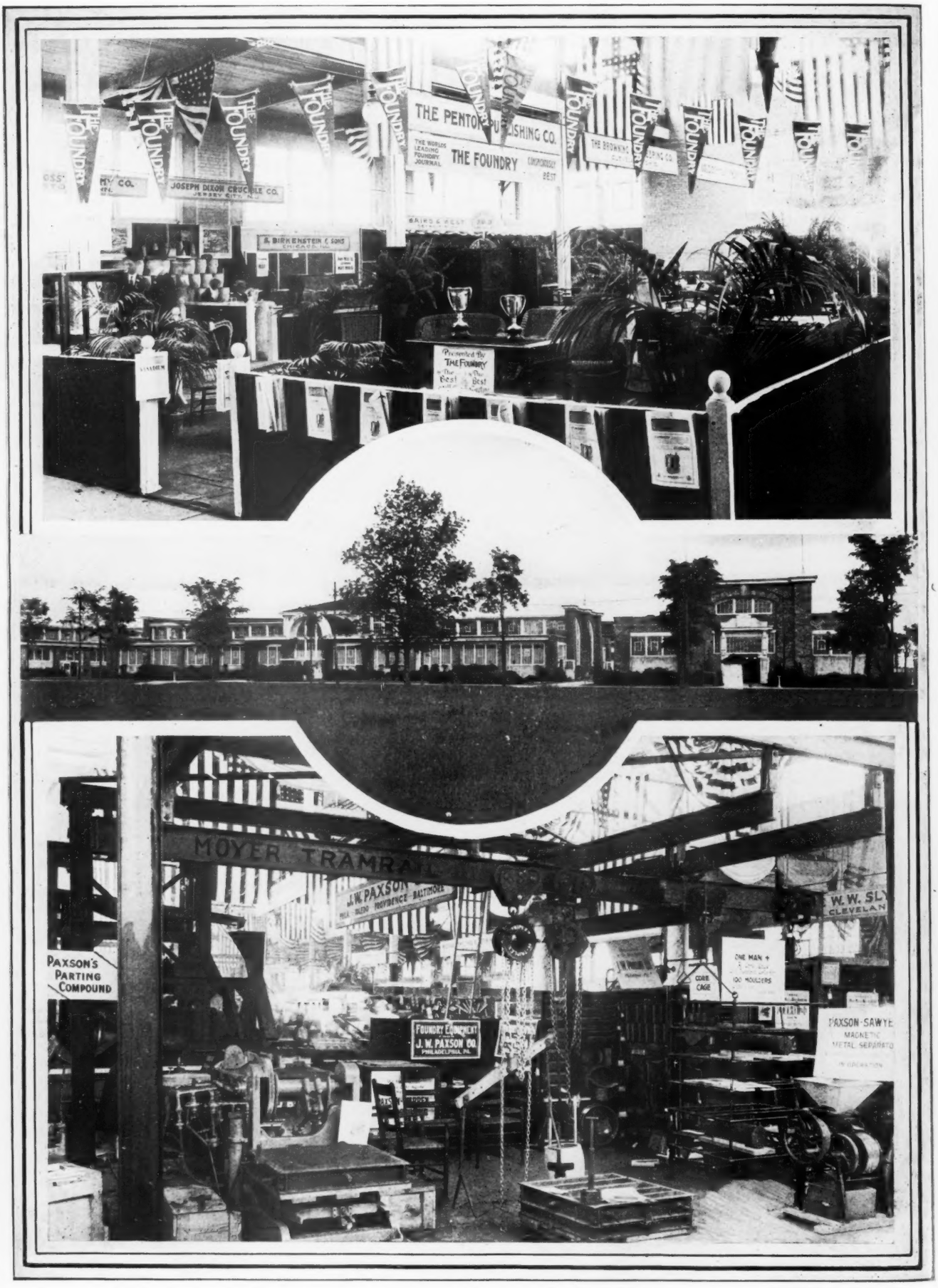
The annual business meeting of the Foundry and Manufacturers' Supply Association was held at the Hotel Cadillac Friday evening, June 10. President F. N. Perkins requested Frederic B. Stevens to preside. The report of the secretary showed that 26 new members had been enrolled during the year, while six had withdrawn, making the present membership 119. The amount of space sold to exhibitors totalled 30,100 square feet, as compared with 17,300 square feet at Cincinnati in 1909. From exhibitors was collected $14,655 and $400 is still outstanding. From dues, $2,975 was realized. The receipts added to the balance of last year reached a total of $22,110, and the disbursements $6,696, leaving a balance of $15,424. The financial condition of the organization proved exceedingly gratifying to the members, and is in striking contrast to the indebtedness of the organization two years ago, following the Toronto exhibition. To President F. N. Perkins, who retires this year, great credit is due for the able manner in which he has administered the affairs of the association during the two years he has served as chief executive. Following the Cincinnati exhibition a 30 per cent dividend was declared and a fund of $1,500 was retained in the treasury to defray extraordinary expenses during the year. A dividend equally large will undoubtedly be declared this year without impairing the surplus. A resolution was adopted providing for the distribution of the funds in the treasury after the 1909 convention among the exhibitors at Cincinnati. The president was authorized to appoint a committee of three to investigate the feasibility of incorporating the association, and a report is to be made to the members within 90 days. A resolution to refund to the Detroit local committee the sum of $11,200, presented the organization, was withdrawn after being briefly discussed. Major Joseph T. Speer, of Pittsburg, president of the American Foundrymen's Association, extended to the Foundry and Manufacturers' Supply Association an invitation to meet in Pitsburg in 1911 during the week of the convention of the allied foundrymen's organizations. Officers for the ensuing year were unanimously elected as follows:

President, George R. Rayner, Carborundum Co., Niagara Falls, N. Y.

Vice presidents: Wilfred Lewis, Tabor Mfg. Co., Philadelphia; E. D. Frohman, S. Obermayer Co., Pittsburg; T. S. Hammond, Whiting Foundry Equipment Co., Harvey, Ill.; Harry D. Gates, Thomas W. Pangborn Co., New York City.

(Continued on page 263.)

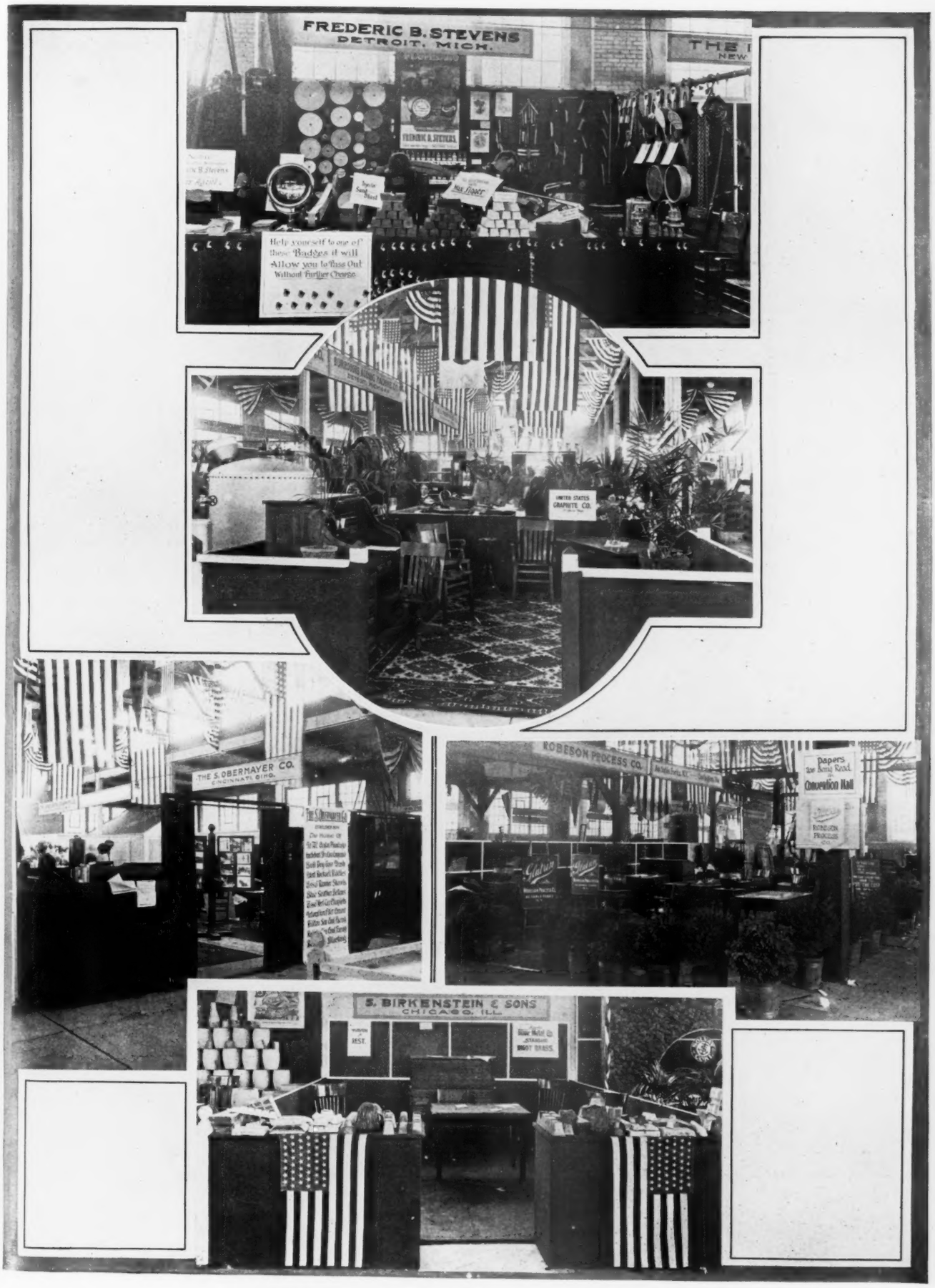
SOLVAY COKE EXHIBIT BY BAIRD & WEST, DETROIT, AND PICKANDS, BROWN & CO., CHICAGO, WHICH WAS AWARDED *The Foundry* CUP FOR THE BEST STILL EXHIBIT



THE BOOTH OF *The Foundry*, WHERE THE SILVER CUPS FOR THE BEST OPERATING EXHIBIT AND THE BEST STILL EXHIBIT, WERE DISPLAYED

THE EXPOSITION BUILDINGS

J. W. PAXSON CO., SHOWING EXHIBIT OF THE MOYER TRAMRAIL


FREDERIC B. STEVENS
DETROIT, MICH.
Help yourself to one of these Baddges it will Allow you to Pass Out Without Further Charge
THE S. OBERMAYER CO.
CINCINNATI, OHIO.
ROBESON PROCESS CO.
Papers
Convention Hall
S. BIRKENSTEIN & SONS
CHICAGO, ILL.

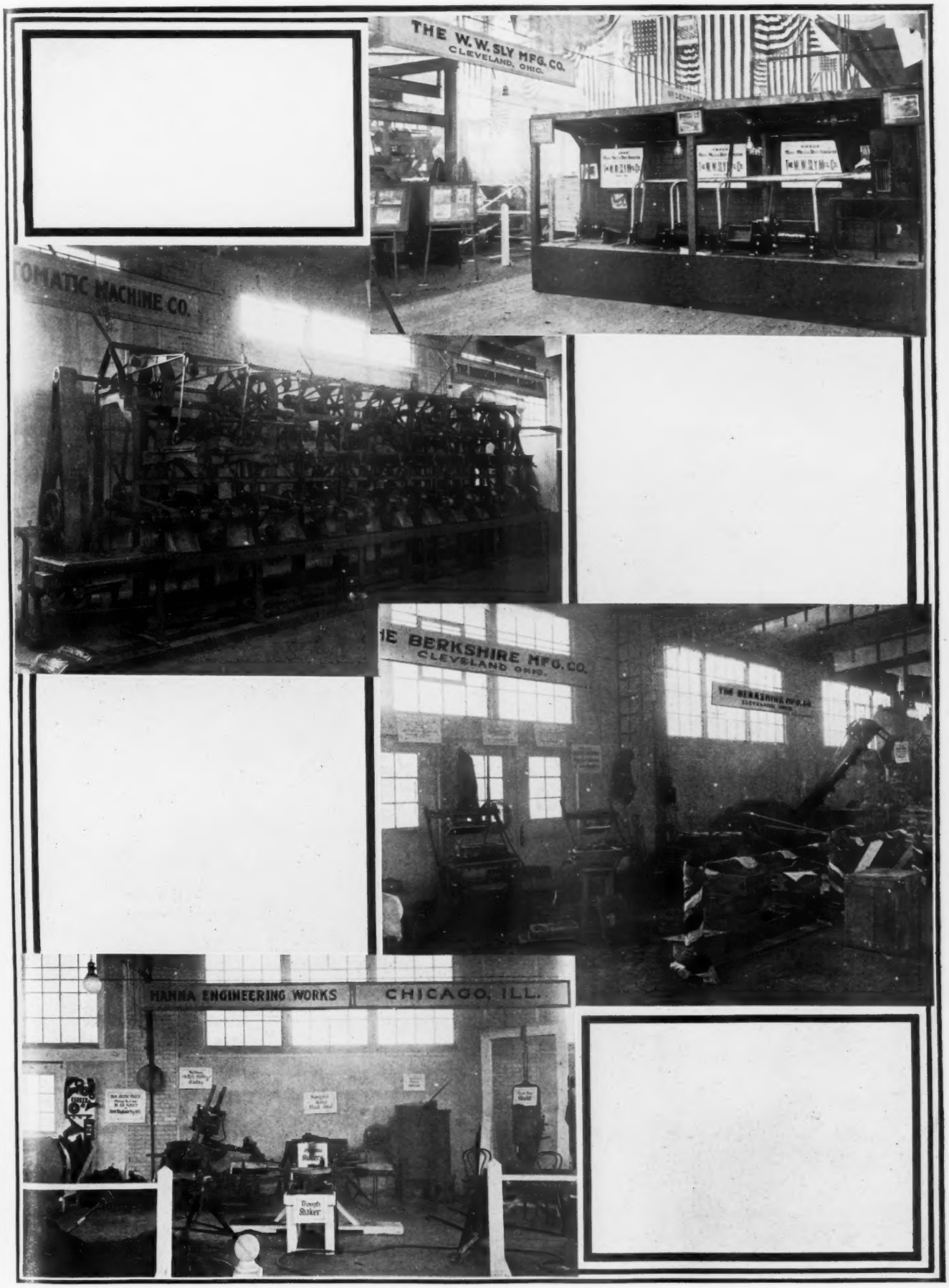
FREDERIC B. STEVENS

VIEW IN THE ADMINISTRATION BUILDING, SHOWING UNITED STATES GRAPHITE CO.'S BOOTH IN THE FOREGROUND

S. OBERMAYER CO. ROBESON PROCESS CO.

S. BIRKENSTEIN & SONS

ROGERS, BROWN & CO.
WM. SELLERS & CO., INC.
INGERSOLL-RAND CO.
BAYER PATTERN PLATE & MFG. CO.
NORTHERN ENGINEERING WORKS
E. KILLING'S MOLDING MACHINE WORKS
SAND MIXING MACHINE CO.

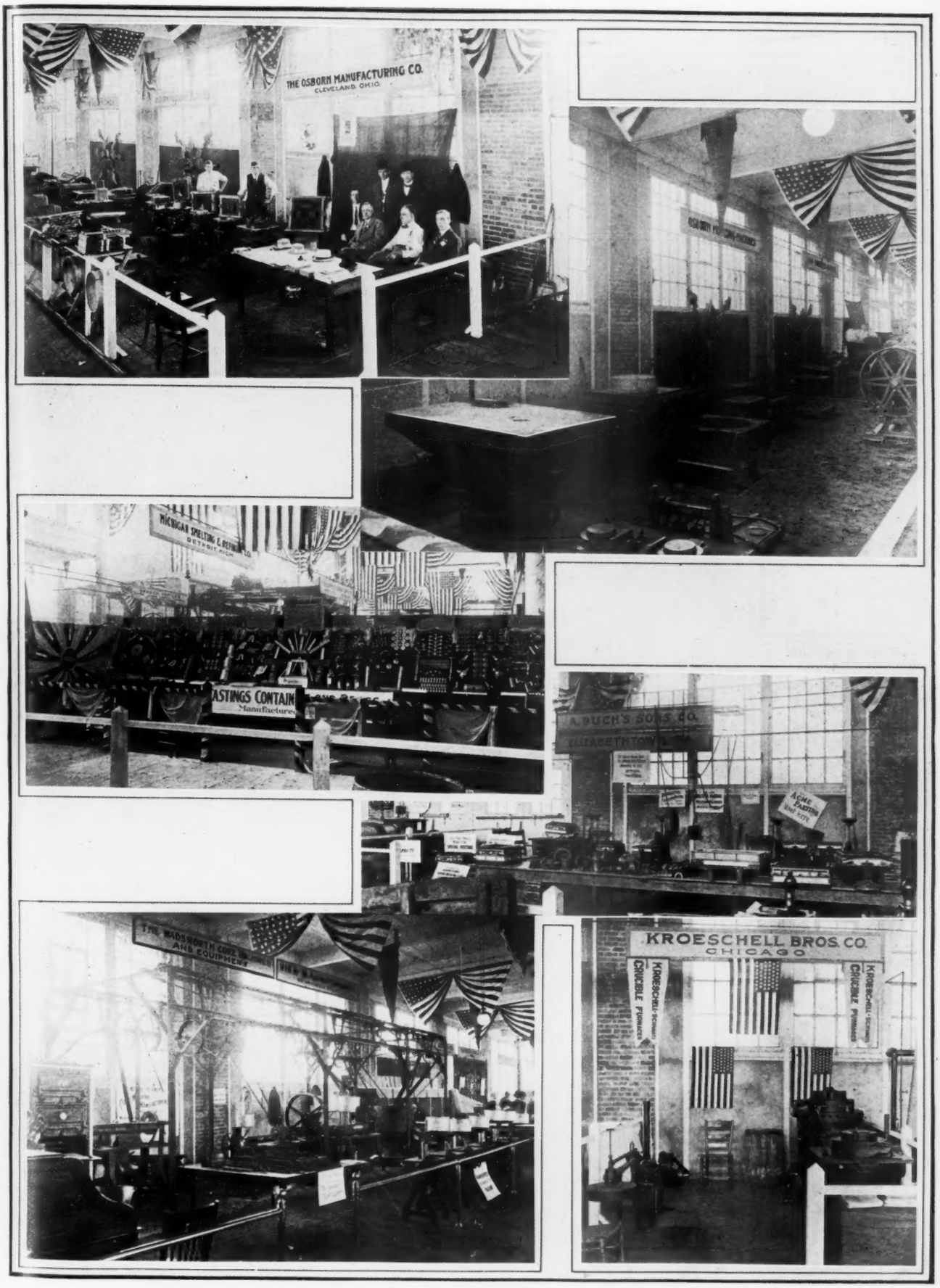


ROBINSON AUTOMATIC MACHINE CO.
HANNA ENGINEERING WORKS

W. W. SLY MFG. CO.
BERKSHIRE MFG. CO.

DETROIT FOUNDRY SUPPLY CO.
J. S. MCCORMICK CO.
BROWN SPECIALTY MACHINERY CO.

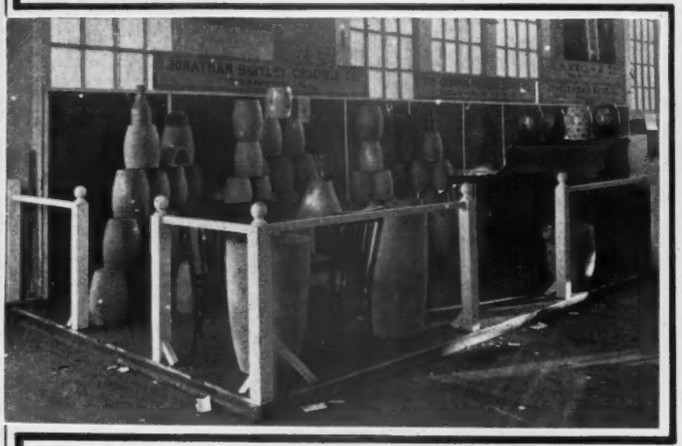
CARBORUNDUM CO.
CLEVELAND WIRE SPRING CO.
THOMAS W. PANGBORN CO.

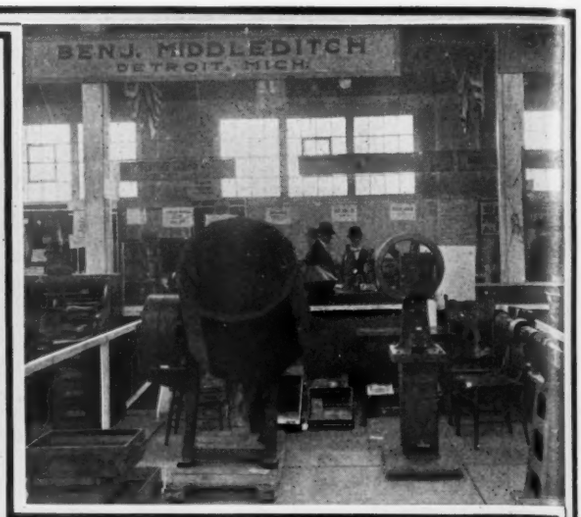


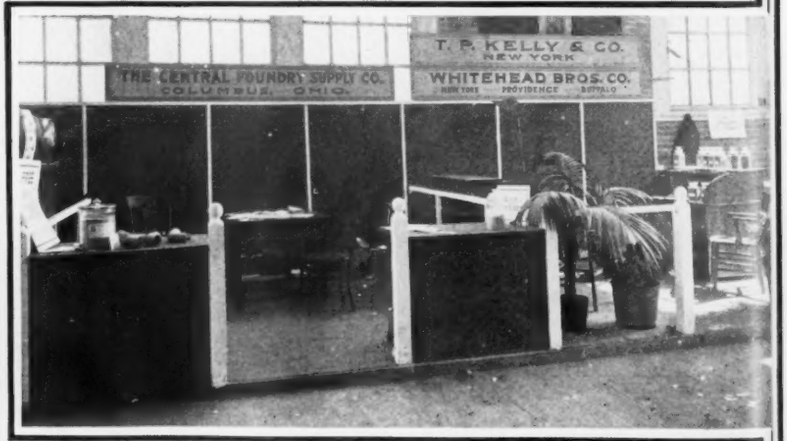
Osborn Mfg. Co.

Michigan Smelting & Refining Co.
Falls Rivet & Machine Co.

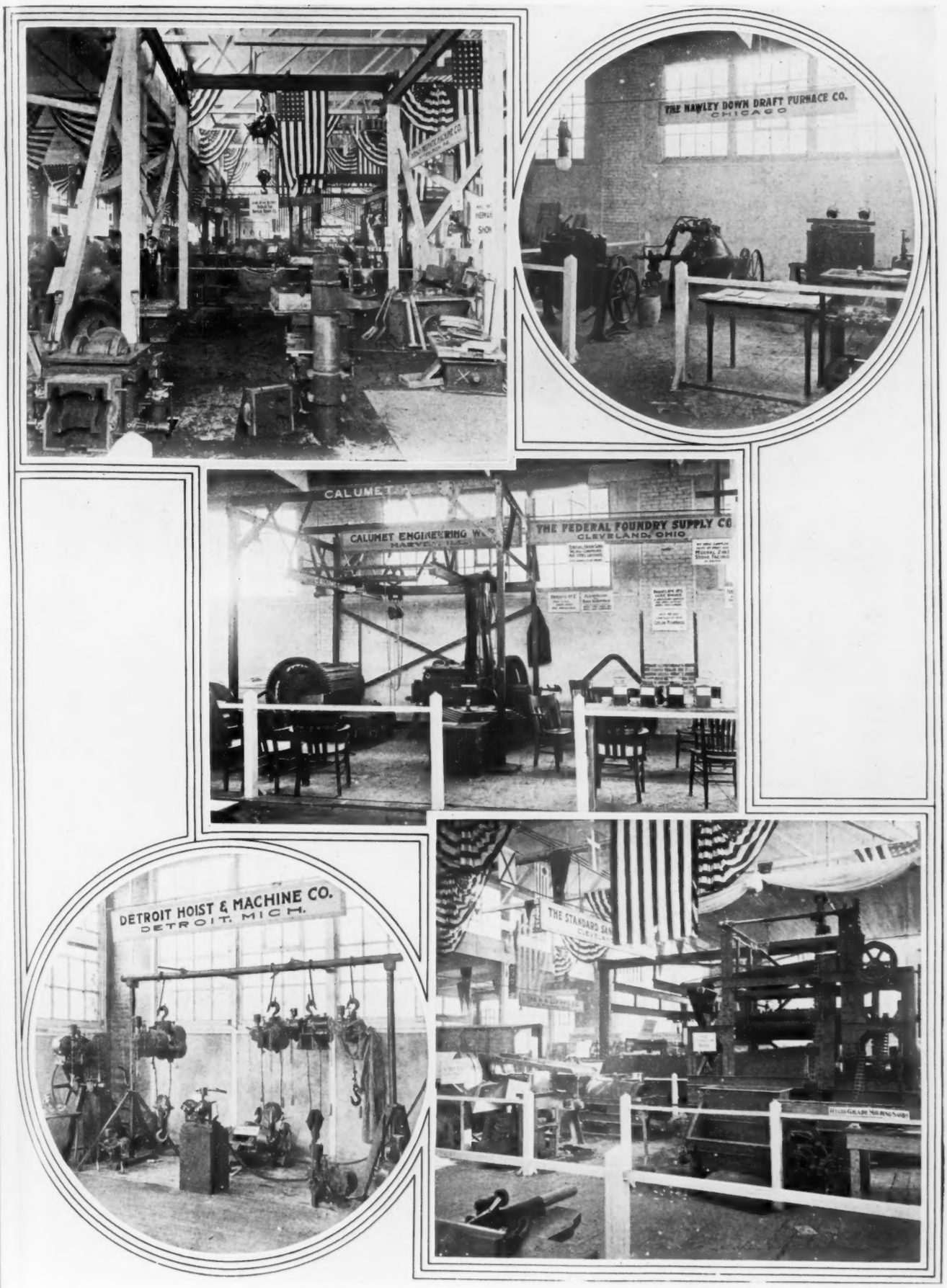
A. Buch's Sons Co.
Kroeschell Bros. Co.





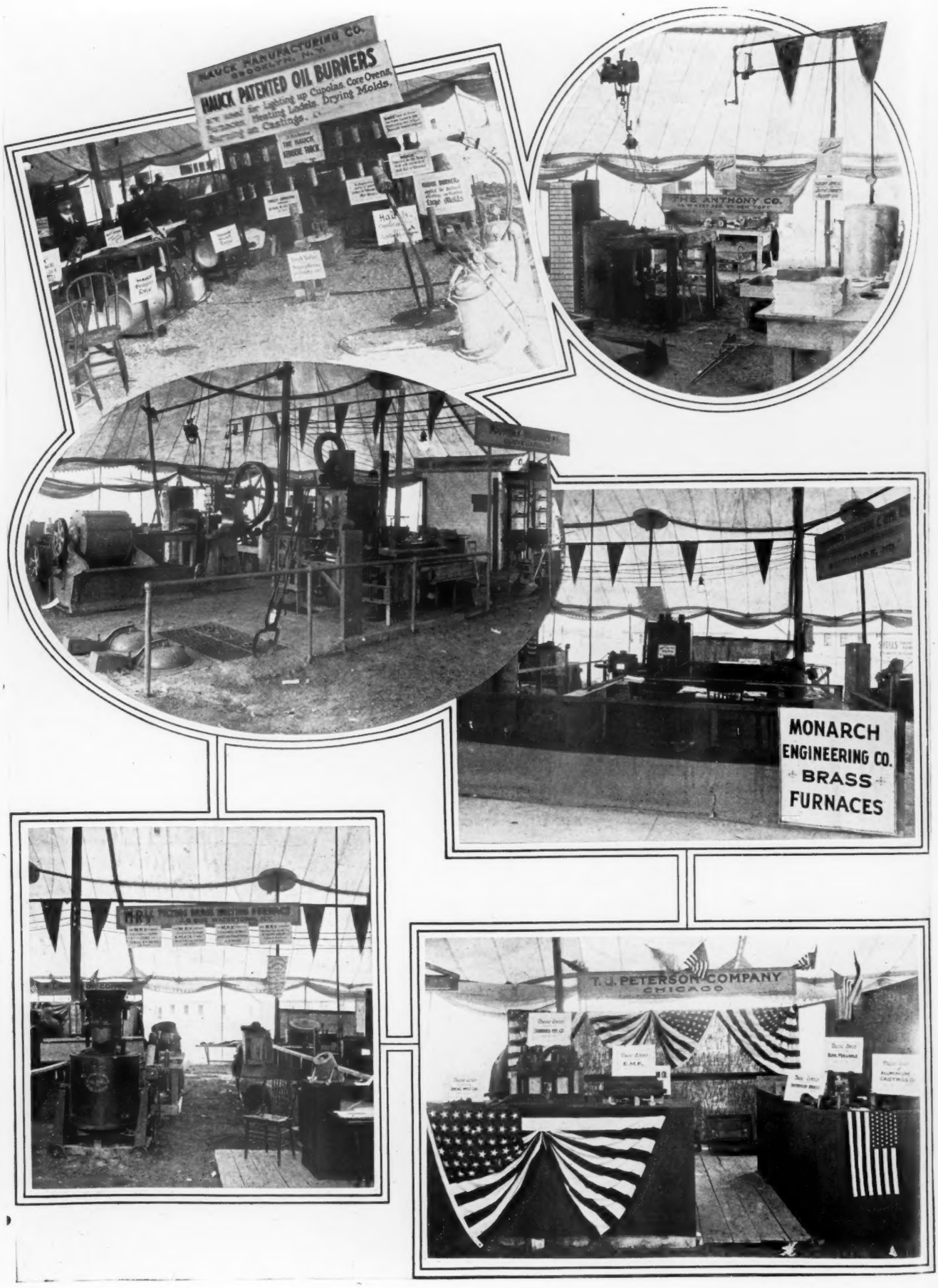


JONATHAN BARTLEY CRUCIBLE CO. BENJAMIN MIDDLEDITCH T. P. KELLY & CO.
OLIVER MACHINERY CO.
BROWNING ENGINEERING CO. CENTRAL FOUNDRY SUPPLY CO. WHITEHEAD BROS. CO.



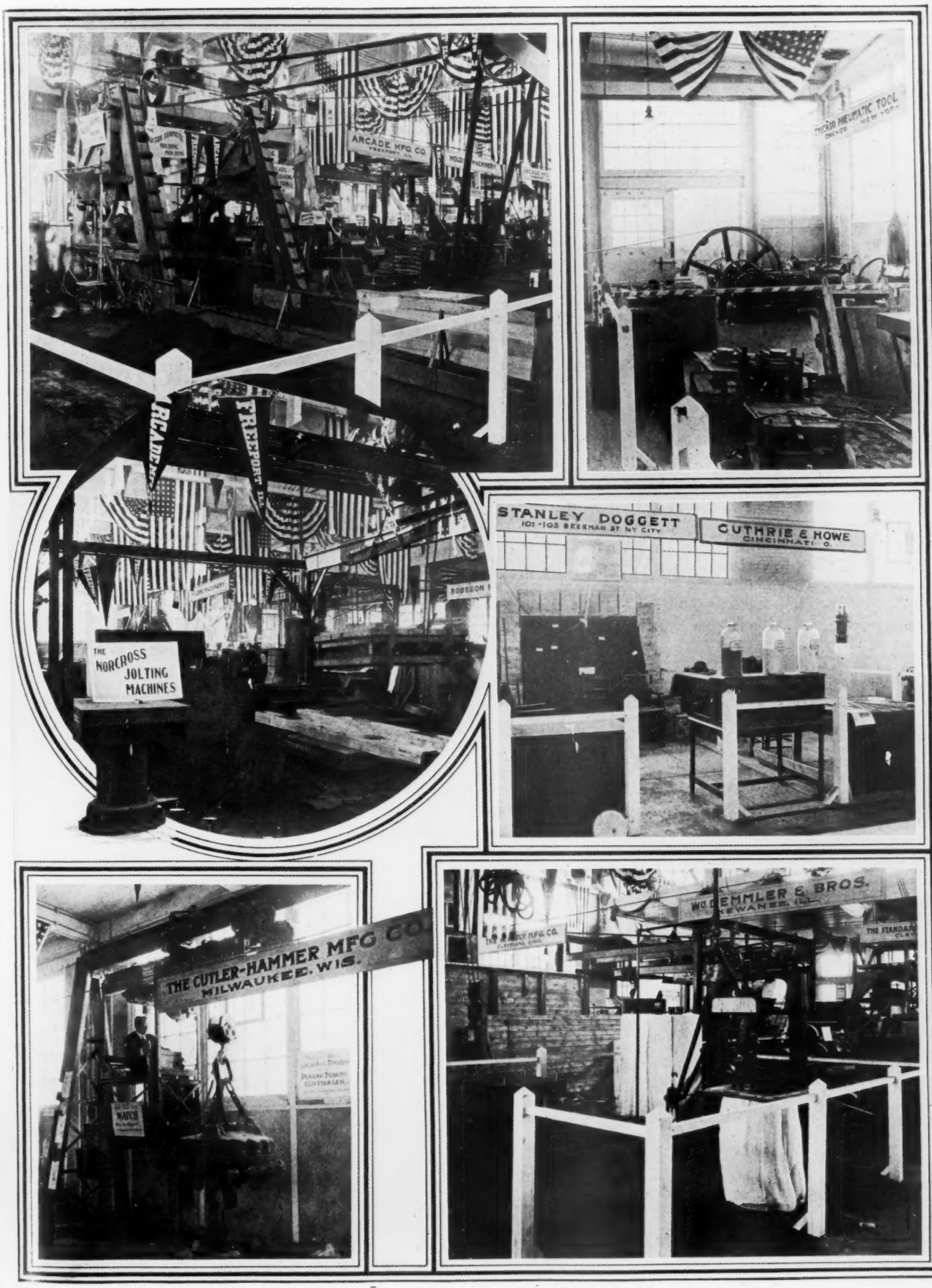
HERMAN PNEUMATIC MACHINE CO.
CALUMET ENGINEERING WORKS
DETROIT HOIST & MACHINE CO.

HAWLEY DOWN DRAFT FURNACE CO.
FEDERAL FOUNDRY SUPPLY CO.
STANDARD SAND & MACHINE CO.



HAUCK MFG. CO.
J. D. SMITH FOUNDRY SUPPLY CO.
J. B. VICE

ANTHONY CO.
MONARCH ENGINEERING & MFG. CO.
T. J. PETERSON CO.



ARCADE MFG. CO.

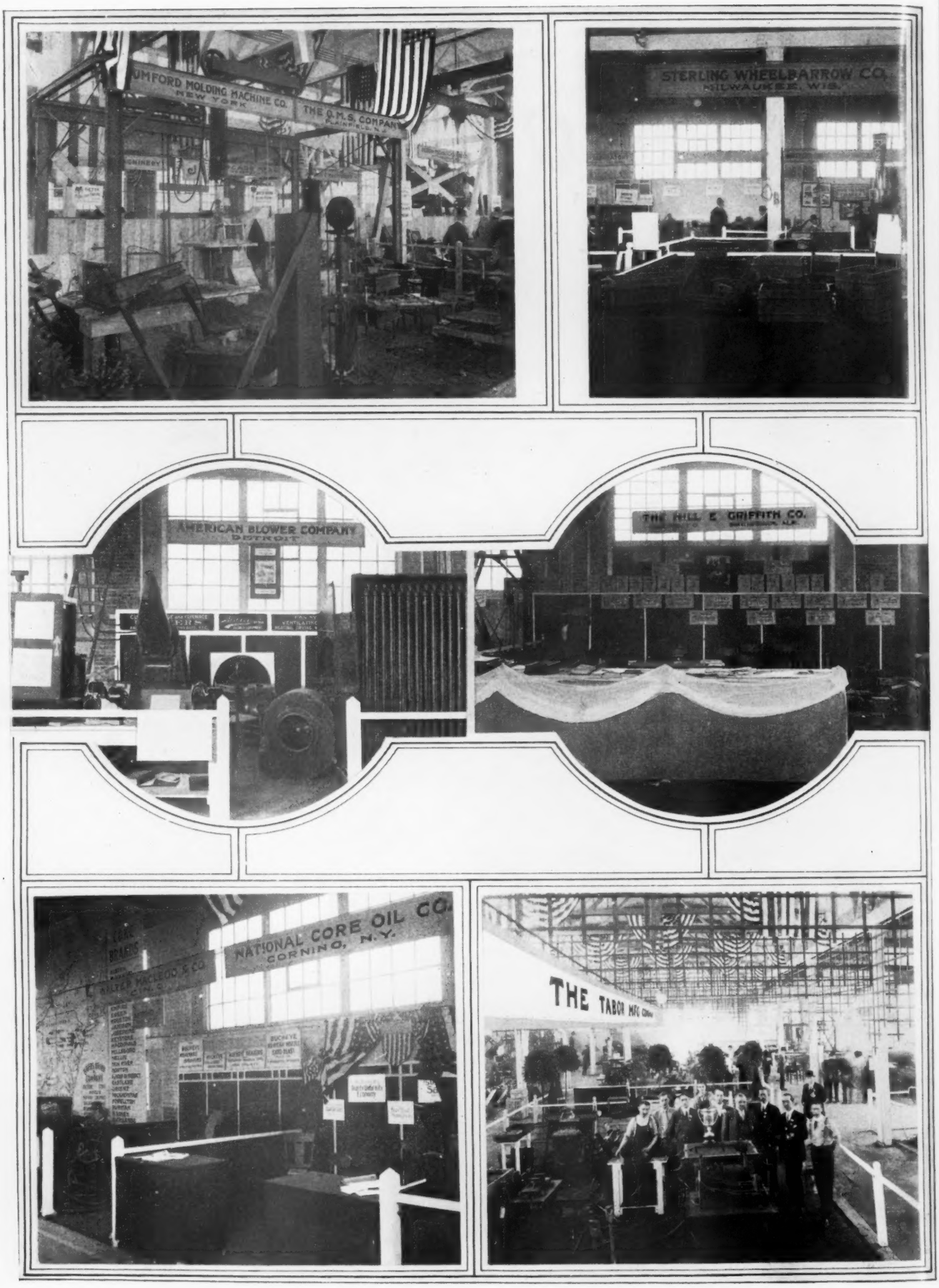
CHICAGO PNEUMATIC TOOL CO.

STANLEY DOGGETT

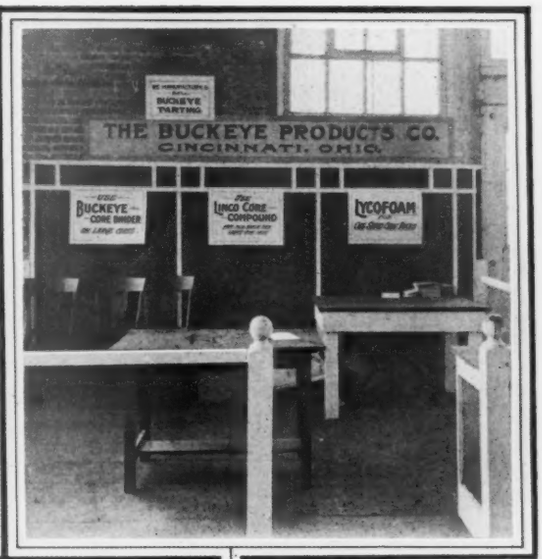
GUTHRIE & HOWE

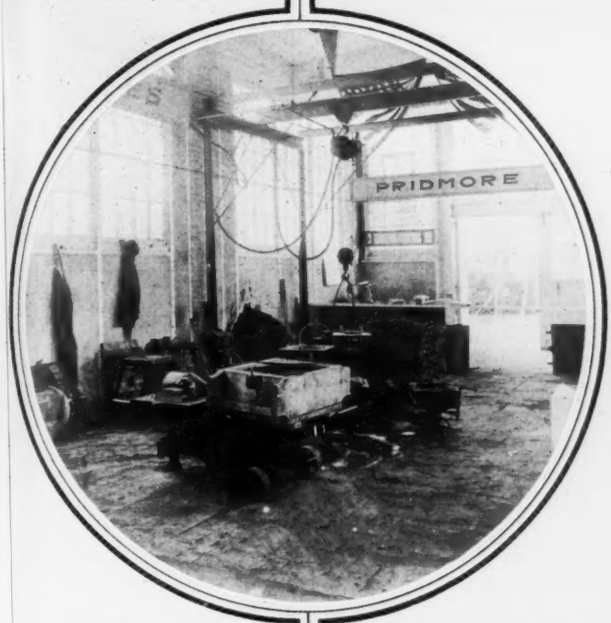
CUTLER-HAMMER MFG. CO.

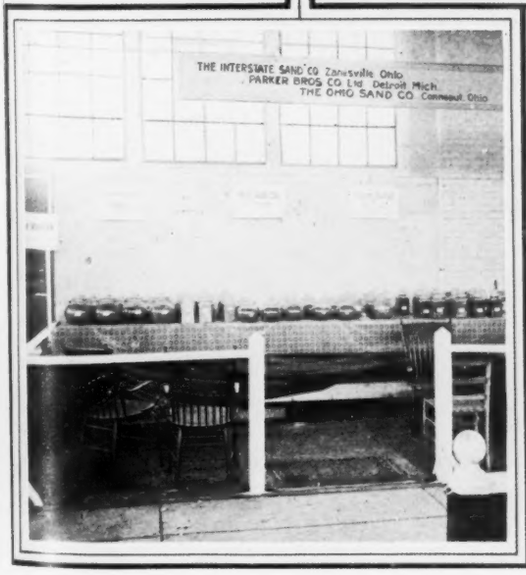
WILLIAM DEMMLER & BROS.

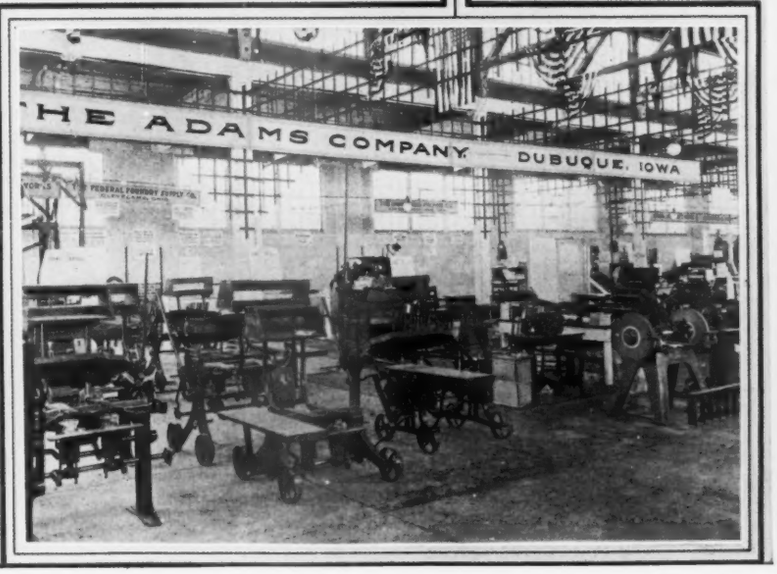


MUMFORD MOLDING MACHINE CO. Q. M. S. CO.
STERLING WHEELBARROW CO.
AMERICAN BLOWER CO.
THE HILL & GRIFFITH CO.
WALTER MACLEOD & CO. NATIONAL CORE OIL CO.
TABOR MFG. CO.









HENRY E. PRIDMORE
INTERSTATE SAND CO.
PARKER BROS. CO., LTD.
OHIO SAND CO.

BUCKEYE PRODUCTS CO.

ADAMS CO.

The Committee on Awards

MAJOR JOSEPH T. SPEER, ARTHUR T. WATERFALL, HENRY A. CARPENTER AND STANLEY G. FLAGG JR.

CHEMICAL STANDARDS FOR GRAY IRON*

Analyses of a wide range of iron castings including recommendations for standard chemical properties --- Summary of the report

By JOHN JERMAIN PORTER

UNDER this heading is presented what is probably the largest collection of analyses of iron castings ever gathered into one table, and it is thought that the information contained should be of considerable value and interest. The sources of this data are three in number; first, published work; second, the private notes of the writer; third, the replies to the inquiries sent out by the committee. Regarding this last source, which has supplied the greater number of analyses, approximately 1,000 inquiries were sent out to as many different foundries, selected largely at random from *Penton's Foundry List.* These inquiries ran in substance as follows:

At the last convention of the American Foundrymen's Association it was decided to make an attempt to formulate chemical standards for iron castings, in the belief that such standards would be of great use both to the individual foundryman and to the industry as a whole.

The information on which these should be based could, of course, be obtained by analyzing typical castings bought in the open market. This would, however, involve much trouble and expense, and will be unnecessary if foundrymen will freely donate the information for the good of the industry.

We urge you, therefore, to act generously in giving us the data indicated below, and since composition is but one item in the successful manufacture of castings, we feel sure that in so doing there can be no possible detriment to your personal interests.

Replies will, of course, be entirely confidential as regards the names of those giving information. There is desired the following information:

Name or class of castings, silicon, sulphur, phosphorus, manganese, combined carbon, graphitic carbon, total carbon.

*Presented at the Detroit Convention of the American Foundrymen's Association.

To this letter about 10 per cent of replies were received, the greater number of which contained more or less information.

Classification of Castings.

Regarding the classification of castings, it is evidently impossible to consider as separate cases all the different patterns. Nor would this be desirable, since any foundry must itself class its castings into a comparatively few groups, which are each poured from one kind of iron. For example, a shop doing machine tool work may make castings from several hundred patterns and will use not to exceed four mixtures of iron for all of these, probably dividing the work into light, medium and heavy castings, with possibly a special mixture for pulleys. It is thought, therefore, that a classification according to use or properties necessary is, in the majority of cases, desirable.

Thickness is, of course, taken into consideration, since this largely determines the percentage of silicon necessary, and it has been the aim to subdivide the various classes according to section wherever possible. In this respect the writer has endeavored to follow the definitions of the American Society for Testing Materials, which has grouped castings according to thickness as follows:

Castings having any section less than ½-inch thick shall be known as light castings.

Castings in which no section is less than 2 inches thick shall be known as heavy castings.

Medium castings are those not included in the above definitions.

It is unfortunately true that there is much lacking in the accompanying table, many important classes of castings being entirely omitted, while others are inadequately represented by only one or two analyses. These deficiencies are due to the lack of available data in certain cases, and it is to be hoped that they may be at least partially remedied by future work.

Malleable cast iron is omitted entirely, partly because of the small amount of data obtained and partly because its manufacture is a process entirely different from those involved in the ordinary iron foundry.

Arrangement.

The last analysis under each head is the tentative standard or probable best analysis *suggested* by your committee. It should be clearly understood in this connection that while this is based on careful study of both theory and practice, it represents only the individual opinion of the writer, and is not necessarily infallible.

Furthermore, these suggestions are incomplete in certain other respects. The most desirable percentage of silicon, for example, will depend largely on the exact thickness of the casting and the practice followed in shaking out. These factors, being in many cases undetermined, have been allowed for by giving fairly wide limits to this element. Again the possibilities in the use of purifying alloys have not been taken into account, although they have been discussed in the preceding parts, and the use of steel scrap has been ignored except that the "low" total carbon specified in some cases must, as a rule, be obtained in this way. Finally, in many cases, a very wide range of composition is permissible and compatible with the best results, and in such cases the question of cost will be the first element to be considered in fixing the composition.

Acid Resisting Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.00	0.050	0.50			3.00
2.30	low	0.20	0.41		3.60
0.80-2.00	0.02-0.03	0.40-0.60	1.00-2.00		3.00-3.50
		Suggested Analysis.			
1.00-2.00	under 0.05	under 0.40	1.00-1.50		3.00-3.50

Acid Stills and Eggs. (See Acid Resisting Castings.)

Agricultural Machinery, Ordinary.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20-2.80	under 0.085	under 0.70	under 0.70		
2.65	0.050	0.81	0.70	0.15	3.50
2.25	0.070	0.70	0.80	0.30	3.50
2.10	0.068	0.73	0.45	0.47	3.42
2.00	0.089	0.89	0.46	0.50	3.39
		Suggested Analysis.			
2.00-2.50	0.06-0.08	0.60-0.80	0.60-0.80		

Agricultural Machinery, Very Thin.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.90	0.050	0.85	0.70	0.10	3.50
2.50	0.080	0.65	0.60	0.30	3.50
		Suggested Analysis.			
2.25-2.75	0.06-0.08	0.70-0.90	0.50-0.70		

Air Cylinders.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20-1.50	under 0.09	0.35-0.60	0.50-0.80		
1.90	0.074	0.50	0.65		
1.12	0.085	0.40	0.70	0.70	3.50
0.95	0.100	0.30	0.90	0.80	3.40
2.00	0.070	0.30	0.60	0.40	
		Suggested Analysis.			
1.00-1.75	under 0.09	0.30-0.50	0.70-0.90		3.00-3.30

Ammonia Cylinders.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20-1.90	under 0.095	under 0.70	0.60-0.80		
		Suggested Analysis.			
1.00-1.75	under 0.09	0.30-0.50	0.70-0.90		3.00-3.30

Annealing Boxes, Pots and Pans.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20	0.060	0.10	0.40		
1.80	0.03	0.70	0.60		2.90
1.53	0.04	0.33	1.08	0.58	3.68
		Suggested Analysis.			
1.40-1.60	under 0.06	under 0.20	0.60-1.00		low

Automobile Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.80	0.030	0.50	0.70	0.60	3.50
1.65	0.076	0.45	0.65	0.55	
2.35	0.072	0.60	0.70	0.40	
		Suggested Analysis.			
1.75-2.25	under 0.08	0.40-0.50	0.60-0.80		

Automobile Cylinders.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.65	0.076	0.45	0.65	0.55	
2.31	0.094	0.50	0.43	0.51	3.35
2.70	0.053	0.46	0.23	0.44	3.02
2.45	0.102	0.72	0.41	0.41	3.47
2.59	0.083	0.57	0.47	0.11	3.35
2.55	0.104	0.82	0.32	0.09	3.04
2.98	0.047	0.89	0.27	0.14	3.19
2.67	0.111	0.73	0.38	0.10	3.24
2.30	0.084	0.81	0.52	0.59	3.35
1.60	0.083	0.54	0.42	0.66	3.75
3.26	0.159	0.93	0.44	0.03	2.87
1.72	0.091	0.58	0.48	0.62	2.52
1.67	0.068	0.44	0.82	0.62	3.91
1.38	0.093	0.62	0.52	0.76	3.61
1.47	0.075	0.13	0.60		
1.50	0.103	0.86	0.43		
1.99	0.130	0.65	0.39	0.45	3.17
1.89	0.090	0.70	0.39	0.77	3.34
2.29	0.090	0.83	0.60	0.90	4.16
		Suggested Analysis.			
1.75-2.00	under 0.08	0.40-0.50	0.60-0.80	0.55-0.65	3.00-3.25

Automobile Fly Wheels.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.35	0.072	0.60	0.70	0.40	
3.10	0.045	0.35	0.55	0.27	
		Suggested Analysis.			
2.25-2.50	under 0.07	0.40-0.50	0.50-0.70		

Balls for Ball Mills.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.00	0.100	0.30	0.50		low
		Suggested Analysis.			
1.00-1.25	under 0.08	under 0.20	0.60-1.00		low

Bed Plates.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20	0.090	0.55	0.50		
1.32	0.090	0.40	0.60		
1.65		0.28	0.92	0.72	
1.85	0.080	0.60	0.55	0.50	3.25-3.50
1.80-2.20	0.04-0.06	0.45-0.55	0.40-0.50	0.40-0.50	3.40-3.60
1.65-1.85	0.070	0.65-0.80	0.60-0.75		3.85
		Suggested Analysis.			
1.25-1.75	under 0.10	0.30-0.50	0.60-0.80		

Binders. (See Agricultural Machinery.)

Boiler Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.50	under 0.07	under 0.20	0.80-1.0		
2.25	0.060	0.62	0.59		
		Suggested Analysis.			
2.00-2.50	under 0.06	under 0.20	0.60-1.0		

Brake Shoes.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.50		low			low
2.00-2.50	under 0.15	under 0.70	under 0.70		
2.00-2.50	under 0.15	under 0.70	under 0.70		
1.40-1.80	0.06-0.08	0.50-0.80	0.45-0.60	0.40-0.65	3.50
1.86	0.183	1.93	0.33	1.22	3.01
		Suggested Analysis.			
1.40-1.60	0.08-0.10	0.30	0.50-0.70		low

Car Castings, Gray Iron. (See also Brake Shoes and Car Wheels.)

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20-2.80	under 0.085	under 0.70	under 0.70		
1.40-1.80	0.06-0.08	0.50-0.80	0.45-0.60	0.40-0.65	3.50
2.25	0.050	0.60	0.75		3.50
1.75	0.070	0.85	0.60		
		Suggested Analysis.			
1.50-2.25	under 0.08	0.40-0.60	0.60-0.80		

Car Wheels, Chilled.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.50-0.70	0.05-0.07	0.35-0.45	0.30-0.50	0.50-0.75	3.50
0.58-0.68	0.05-0.08	0.25-0.45	0.15-0.27	0.63-1.0	
0.73	0.080	0.43	0.44	1.25	4.31
0.86	0.127	0.35	0.49	0.92	3.47
0.70	0.08	0.50	0.40	0.60	3.50
0.58	0.141	0.38	0.48	0.90	3.63
0.57	0.101	0.41	0.42		
0.68	0.188	0.36	0.53		
0.67	0.170	0.38	0.81	0.74	3.66
0.50-0.60	0.08-0.10	0.30-0.40	0.45-0.55	0.70-0.80	3.50
		Suggested Analysis.			
0.60-0.70	0.08-0.10	0.30-0.40	0.50-0.60	0.60-0.80	3.50-3.70

Car Wheels, Unchilled. (See Wheels.)

Chemical Castings. (See Acid Resisting Castings.)

Chilled Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.80-1.00	0.09-0.11	0.50	0.50		
1.20-1.40		low			low
1.00	0.08	0.40	0.75		3.25
1.35	0.117	0.60	0.54	0.65	3.00
0.50	0.200	0.45	1.50	3.00	3.00
1.20	0.090	0.30	0.50	1.20	3.20
1.20	0.080	0.30	1.25		3.50
0.75	0.90	0.30	0.30	3.00	3.20
		Suggested Analysis.			
0.75-1.25	0.08-1.0	0.20-0.40	0.80-1.2		

Chills.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.07	0.073	0.31	0.48	0.23	2.64
		Suggested Analysis.			
1.75-2.25	under 0.07	0.20-0.40	0.60-1.00		

Collars and Couplings for Shafting.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.60	0.040	0.55	0.55	0.30	3.57
		Suggested Analysis.			
1.75-2.00	under 0.08	0.40-0.50	0.60-0.80		

Cotton Machinery. (See also Machinery Castings.)

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20-2.30	under 0.09	0.70	0.60	0.45	3.45
		Suggested Analysis.			
2.00-2.25	under 0.08	0.60-0.80	0.60-0.80		

Crusher Jaws.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.80-1.00	0.09-0.11	0.50	0.50		
1.00	0.080	0.40	0.75		3.25
0.50	0.20	0.45	1.50	3.00	3.00
		Suggested Analysis.			
0.80-1.00	0.08-0.10	0.20-0.40	0.80-1.2		

Cutting Tools, Chilled Cast Iron.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.35	0.117	0.60	0.54	0.65	3.00
		Suggested Analysis.			
1.00-1.25	under 0.08	0.20-0.40	0.60-0.80		

Cylinders. (See Air Cylinders, Ammonia Cylinders, Automobile Cylinders, Gas Engine Cylinders, Hydraulic Cylinders, Locomotive Cylinders, Steam Cylinders.)

Cylinder Bushings, Locomotive. (See Locomotive Castings, Heavy.)

Dies for Drop Hammers.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.40	0.060	0.10	0.40		
1.40	0.090	0.40	0.70	1.00	3.20
		Suggested Analysis.			
1.25-1.50	under 0.07	under 0.20	0.60-0.80		low

Diamond Polishing Wheels.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.70	0.063	0.30	0.44	1.60	2.97

Dynamo and Motor Frames, Bases and Spiders, Large.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.95	0.042	0.40	0.39	0.59	3.82
1.90	0.08	0.47	0.60	0.64	3.79
2.15	0.070	0.75	0.60	0.55	3.80
2.10	0.070	0.55	0.40		3.50
		Suggested Analysis.			
2.00-2.50	under 0.08	0.50-0.80	0.30-0.40	0.20-0.30	low

Dynamo and Motor Frames, Bases and Spiders, Small.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
3.19	0.075	0.89	0.35	0.06	2.95
2.30	0.070	0.55	0.40		3.50
2.50	0.070	0.75	0.60	0.55	3.95
		Suggested Analysis.			
2.50-3.00	under 0.08	0.50-0.80	0.30-0.40	0.20-0.30	low

Electrical Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
3.19	0.075	0.89	0.35	0.06	2.95
1.95	0.042	0.40	0.39	0.59	3.82
1.90	0.080	0.47	0.60	0.64	3.79
2.15	0.070	0.75	0.60	0.55	3.80
2.50	0.070	0.75	0.60	0.55	3.95
2.10	0.070	0.55	0.40		3.50
2.30	0.070	0.55	0.40		3.50
		Suggested Analysis.			
2.00-3.00	under 0.08	0.50-0.80	0.30-0.40	0.20-0.30	low

Eccentric Straps. (See Locomotive Castings and Machinery Castings.)

Engine Castings. (See Bed Plates, Engine Frames, Fly Wheels, Locomotive Castings, Machinery Castings, Steam Cylinders.)

Engine Frames. (See also Machinery Castings.)

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.25	0.080	0.55	0.60		
1.60	0.090	0.50	0.60		
1.32	0.100	0.40	0.60		
		Suggested Analysis.			
1.25-2.00	under 0.09	0.30-0.50	0.60-1.0		

Fans and Blowers. (See Machinery Castings.)

Farm Implements.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.00	0.089	0.89	0.46	0.50	3.39
2.10	0.068	0.68	0.45	0.47	3.32
		Suggested Analysis.			
2.00-2.50	0.06-0.08	0.50-0.80	0.60-0.80		

Fire Pots.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.50	under 0.07	under 0.20	0.80-1.0		
		Suggested Analysis.			
2.00-2.50	under 0.06	under 0.20	0.60-1.0		low

Fly Wheels. (See also Automobile Fly Wheels and Machinery Castings.)

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20	0.090	0.55	0.50		
1.50	0.090	0.50	0.60		
		Suggested Analysis.			
1.50-2.25	under 0.08	0.40-0.60	0.50-0.70		

Friction Clutches.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.00-2.50	under 0.15	under 0.70	under 0.70		
		Suggested Analysis.			
1.75-2.00	0.08-0.10	under 0.30	0.50-0.70		low

Furnace Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.50	under 0.07	under 0.20	0.80-1.0		
2.00	0.085	0.35	0.53		
1.85	0.090	0.70	0.60		
		Suggested Analysis.			
2.00-2.50	under 0.06	under 0.20	0.60-1.00		low

Gas Engine Cylinders.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.45			0.65		
1.98	0.090	0.84	0.63		
1.21	0.117	0.40	0.35	1.40	3.74
1.00-1.25	0.04-0.08	0.20-0.40	0.70-0.80	0.60-0.80	3.00-3.10
		Suggested Analysis.			
1.00-1.75	under 0.08	0.20-0.40	0.70-0.90		3.00-3.30

Gears, Heavy.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.40	0.060	0.10	0.40		
0.94	0.150	0.43	0.31	1.47	
1.60	0.080	0.40	0.60		3.50
1.50-1.75	0.080	0.40-0.60	0.50-0.70		
1.00-1.25	0.075	0.40	0.80-1.0		very low
1.40-1.60	0.04-0.08	0.30-0.50	0.40-0.60	0.50-0.80	3.20-3.40
		Suggested Analysis.			
1.00-1.50	0.08-0.10	0.30-0.50	0.80-1.0		low

Gears, Medium.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.50-2.00	under 0.08	0.35-0.60	0.50-0.80		
1.90	0.060	0.10	0.40		
2.30	0.060	0.60	0.60		3.75
1.90	0.100	0.69	0.58	0.55	3.83
		Suggested Analysis.			
1.50-2.00	under 0.09	0.40-0.60	0.70-0.90		

Gears, Small.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
3.43		1.42	0.90		
2.00	0.100	0.50	0.70		3.50
		Suggested	Analysis.		
2.00-2.50	under 0.08	0.50-0.70	0.60-0.80		

Grate Bars.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.75	low	low			
2.00	0.085	0.35	0.53		
		Suggested	Analysis.		
2.00-2.50	under 0.06	under 0.20	0.60-1.0	under 0.30	low

Grinding Machinery, Chilled Castings for.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.50	0.200	0.45	1.50	3.00	3.00
		Suggested	Analysis.		
0.50-0.75	0.15-0.20	0.20-0.40	1.5-2.0		

Gun Carriages.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.94	0.050	0.44	0.31	0.63	3.03
1.00	0.050	0.30	0.60	1.10	2.50
		Suggested	Analysis.		
1.00-1.25	under 0.06	0.20-0.30	0.80-1.0		low

Gun Iron.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.34	0.003	0.08	1.00	0.93	3.12
1.19	0.055	0.41	0.42	1.13	3.18
1.53	0.050	0.29	0.45	0.42	3.43
0.98	0.06	0.43	0.43	0.75	1.74
0.30		0.44	3.55	1.70	3.90
1.20	0.100	0.30	0.80	1.00	3.00
		Suggested	Analysis.		
1.00-1.25	under 0.06	0.20-0.30		0.80-1.0	low

Hangers for Shafting.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.60	0.040	0.55	0.55	0.30	3.57
		Suggested	Analysis.		
1.50-2.00	under 0.08	0.40-0.50	0.60-0.80		

Hardware, Light.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.84		0.58	1.04		
2.20		0.74	1.10		
2.50		1.21	1.16		
2.51	0.110	0.62	0.41	0.24	3.18
2.70	0.030	0.60	0.50	0.40	3.60
2.50	under 0.050	0.60	0.70		
2.00-2.25	0.050	0.85	0.40		3.85-4.00
		Suggested	Analysis.		
2.25-2.75	under 0.08	0.50-0.80	0.50-0.70		

Heat Resisting Iron.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20	0.060	0.10	0.40		
1.67	0.032	0.09	0.29	0.43	3.87
2.15	0.086	1.26	0.41	0.13	3.30
2.02	0.070	0.89	0.29	0.84	3.60
1.53	0.040	0.33	1.08	0.58	3.68
2.07	0.073	0.31	0.48	0.23	2.64
1.80	0.030	0.70	0.60		
2.75	low	low			
2.50	under 0.07	under 0.20	0.80-1.0		
1.76	0.075	0.63	0.79	0.56	3.68
2.00	0.030	0.70			
		Suggested	Analysis.		
1.25-2.50	under 0.06	under 0.20	0.60-1.00	under 0.30	low

Hollow Ware.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.51	0.110	0.62	0.41	0.24	3.18
		Suggested	Analysis.		
2.25-2.75	under 0.08	0.50-0.70	0.50-0.70		

Housings for Rolling Mills.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.00-1.25	0.085	0.65	0.75		low
		Suggested	Analysis.		
1.00-1.25	under 0.08	0.20-0.30	0.80-1.0		low

Hydraulic Cylinders, Heavy.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.00	0.050	0.30	0.60	1.10	2.50
0.90	0.136	0.39	0.25	1.44	3.34
0.80-1.50	0.07-0.11	0.35-0.50			
1.12	0.085	0.40	0.70	0.70	3.50
0.95	0.100	0.30	0.90	0.80	3.40
1.15	under 0.08	0.50	0.60	1.15	
0.90-1.20	0.06-0.08	0.30-0.50	0.80-1.0	0.80-1.0	2.90-3.10
		Suggested	Analysis.		
0.80-1.20	under 0.10	0.20-0.40	0.80-1.0		low

Hydraulic Cylinders, Medium.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.40	0.060	0.10	0.40		
1.90	0.074	1.50	0.65		
1.62	0.08	0.50	0.60		
1.75	0.070	0.40	0.55	0.50	
		Suggested	Analysis.		
1.20-1.60	under 0.09	0.30-0.50	0.70-0.90		low

Ingot Molds and Stools.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20	0.060	0.10	0.40		
1.67	0.032	0.09	0.29	0.43	3.87
		Suggested	Analysis.		
1.25-1.50	under 0.06	under 0.20	0.60-1.0		

Locomotive Castings, Heavy.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.40-2.00	under 0.085.	under 0.60	under 0.70		
1.25-1.50	0.06-0.08	0.40-0.60	0.45-0.60	0.50-0.70	3.50
1.62	0.098	0.40	0.49		
		Suggested	Analysis.		
1.25-1.50	under 0.08	0.30-0.50	0.70-0.90		

Locomotive Castings, Light.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.40-2.00	under 0.085	under 0.60	under 0.70		
1.50-2.00	0.06-0.08	0.40-0.60	0.45-0.60	0.45-0.55	3.50
		Suggested	Analysis.		
1.50-2.00	under 0.08	0.40-0.60	0.60-0.80		

Locomotive Cylinders.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.25-1.75	under 0.10	under 0.90			
1.40-2.00	under 0.085	under 0.60	under 0.70		
1.25-1.50	0.06-0.08	0.40-0.60	0.45-0.60	0.50-0.70	3.50
1.00-1.40	under 0.11	0.40-0.90	0.40-0.90		
1.41	0.092	0.38	0.39		
1.56	0.061	0.45	0.78		
		Suggested	Analysis.		
1.00-1.50	0.08-0.10	0.30-0.50	0.80-1.0		

Locks and Hinges. (See Hardware, Light.)

Machinery Castings, Heavy.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.05	0.110	0.54	0.35	0.33	2.98
0.85	0.030	0.35	0.92		
0.80-1.50	0.030-0.050	0.35-0.50			
0.90-1.50	0.09-1.2	0.15-0.40	0.20-0.80	0.10-0.30	2.50-2.90
1.85	0.100	0.50	0.60		3.50
1.30	0.090	0.40	0.60		
1.85	0.120	0.60	0.45		3.40-3.55
1.75	0.100	0.50	0.70	0.80	3.65
		Suggested	Analysis.		
1.00-1.50	under 0.10	0.30-0.50	0.80-1.0		low

Machinery Castings, Medium.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.83	0.078	0.50	0.31	0.43	2.93
2.25	0.080	0.55	0.60		
1.60	0.060	0.66			
2.29	0.071	0.66	0.49		
1.60	0.090	0.50	0.60		
2.10	0.110	0.67	0.50		3.40-3.55
2.25	0.060	0.75	0.55		
2.00	0.100	0.75	0.50	0.75	3.50
1.76	0.075	0.63	0.79	0.56	3.68
2.00	0.100	0.50	0.50	0.50	3.60
2.35	0.075	0.45	0.65	0.30	
1.80	0.060	0.80	0.50	0.70	
2.06	0.075	0.78	0.47		3.45
1.40	low	0.20	0.40		
2.00	0.030	0.70			
1.85	0.08	0.60	0.50-0.60	0.50	3.25-3.50
1.50-2.10	0.08-0.09	0.40-0.80	0.20-0.60	0.10-0.40	2.60-3.20
1.80-2.10	under 0.09	0.40-0.90	0.40-0.90		
		SUGGESTED	ANALYSIS.		
1.50-2.00	under 0.09	0.40-0.60	0.60-0.80		

Machinery Castings, Light.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.04	0.044	0.58	0.39	0.32	3.84
2.25	0.080	0.70	0.50	0.20	3.55
2.76	0.037	1.19		0.13	3.66
2.49	0.097	0.90	0.42		3.40
2.51	0.084	0.62	0.61		3.46
2.50	0.100	0.60	0.70		3.50
3.00	0.060	0.65	0.50		3.50
2.40	0.050	0.47	0.59		
2.85	0.064	0.67	0.65		
2.52	0.062	0.66	0.68		
3.15	0.050				
2.50	0.100	0.70	0.60		3.40-3.55
2.20-2.80	0.06-0.08	0.60-1.3	0.20-0.40	0.10-0.60	3.00-3.60
		SUGGESTED	ANALYSIS.		
2.00-2.50	under 0.08	0.50-0.70	0.50-0.70		

Machine Tool Castings. (See Machinery Castings.)

Motor Frames, Bases and Spiders. (See Dynamo.)

Molding Machines. (See Machinery Castings.)

Mowers. (See Agricultural Machinery.)

Niter Pots. (See Acid Resisting Castings and Heat Resisting Castings.)

Ornamental Work.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
4.19	0.080	1.24	0.67	0.03	2.88
2.51	0.110	0.62	0.41	0.24	3.13
2.25		0.60-0.90			
		SUGGESTED	ANALYSIS.		
2.25-2.75	under 0.08	0.60-1.0	0.50-0.70		

Permanent Molds.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.15	0.086	1.26	0.41	0.13	3.30
2.02	0.070	0.89	0.29	0.84	3.60
		SUGGESTED	ANALYSIS.		
2.00-2.25	under 0.07	0.20-0.40	0.60-1.0		

Permanent Mold Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.00-3.00					3.00-4.00
		SUGGESTED	ANALYSIS.		
1.50-3.00	under 0.06		under 0.40		

Piano Plates.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.00	low	0.40	0.60		
		SUGGESTED	ANALYSIS.		
2.00-2.25	under 0.07	0.40-0.60	0.60-0.80		

Pillow Blocks.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.60	0.040	0.55	0.55	0.30	3.50
		SUGGESTED	ANALYSIS.		
1.50-1.75	under 0.08	0.40-0.50	0.60-0.80		

Pipe.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.00	0.060	0.60	0.60		
2.00	0.060	1.00	0.60		
		SUGGESTED	ANALYSIS.		
1.50-2.00	under 0.10	0.50-0.80	0.60-0.80		

Pipe Fittings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.88		0.41	1.10		
1.70	0.058	0.50	0.73	1.16	4.18
2.51	0.110	0.62	0.41	0.24	3.18
		SUGGESTED	ANALYSIS.		
1.75-2.50	under 0.08	0.50-0.80	0.60-0.80		

Pipe Fittings for Superheated Steam Lines.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.72	0.085	0.89	0.48	0.17	2.45
1.40-1.60	0.06-0.09	0.20-0.40	0.45-0.75		3.00-3.25
		SUGGESTED	ANALYSIS.		
1.50-1.75	under 0.08	0.20-0.40	0.70-0.90		low

Piston Rings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.35			0.40		
1.60	0.08	1.15	0.35	0.60	
1.50-2.00	0.06-0.08	0.40-0.60	0.45-0.60	0.45-0.55	3.50
		SUGGESTED	ANALYSIS.		
1.50-2.00	under 0.08	0.30-0.50	0.40-0.60		low

Plow Points, Chilled.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20-1.40		low			low
1.20	0.090	0.30	0.50	1.20	3.20
0.75	0.090	0.30	0.30	3.00	3.20
1.20	0.080	0.30	1.25		3.50
		SUGGESTED	ANALYSIS.		
0.75-1.25	under 0.08	0.20-0.30	0.80-1.0		

Printing Presses. (See Machinery Castings.)

Propeller Wheels.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.15		0.32	0.51	0.60	
1.40	low	0.20	0.40		
		SUGGESTED	ANALYSIS.		
1.00-1.75	under 0.10	0.20-0.40	0.60-1.0		low

Pulleys, Heavy.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.75	0.040	0.55	0.55	0.30	3.57
2.40	0.060	0.60	0.60		3.75
		SUGGESTED	ANALYSIS.		
1.75-2.25	under 0.09	0.50-0.70	0.60-0.80		

Pulleys, Light.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20-2.80	under 0.08	under 0.70	under 0.70		
2.40	under 0.08	0.95	0.70		
2.72	0.040	0.50	0.66		
2.52	0.075	0.77	0.68		3.37
3.35	0.089	0.70	0.47		3.42
2.25	0.040	0.55	0.55	0.30	3.57
2.15	0.080	0.70	0.60	0.40	3.55
		SUGGESTED	ANALYSIS.		
2.25-2.75	under 0.08	0.60-0.80	0.50-0.70		

Pumps, Hand.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.30-2.75	under 0.08	0.60-1.0	0.30-0.50		
		SUGGESTED	ANALYSIS.		
2.00-2.25	under 0.08	0.60-0.80	0.50-0.70		

Radiators.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.15	low	0.80	0.45	0.50	3.50
2.45	0.104	0.44	0.40	0.35	3.40
		SUGGESTED ANALYSIS.			
2.00-2.25	under 0.08	0.60-0.80	0.50-0.70	0.50-0.60	

Railroad Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.20-2.80	under 0.08	under 0.70	under 0.70		
1.40-1.80	0.06-0.08	0.50-0.80	0.45-0.60	0.40-0.65	3.50
2.25	0.050	0.60	0.75		
1.75	0.070	0.85	0.60		
		SUGGESTED ANALYSIS.			
1.50-2.25	under 0.08	0.40-0.60	0.60-0.80		

Retorts. (See Heat Resisting Castings.)

Rolls, Chilled.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.50-1.00	0.01-0.06	0.20-0.80	0.15-1.5	2.60-3.25	
0.80	0.100	0.88	0.16	0.91	2.84
0.71	0.058	0.54	0.39	1.38	3.00
0.65	0.050	0.25	1.50	0.63	3.50
		SUGGESTED ANALYSIS.			
0.60-0.80	0.06-0.08	0.20-0.40	1.0-1.2		3.00-3.25

Rolls, Unchilled (sand cast).

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.75	0.030	0.25	0.66	1.20	4.10

Scales.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.67		1.92	1.90		
2.12		0.61	0.80		
1.70		0.63	1.60		
		SUGGESTED ANALYSIS.			
2.00-2.30	under 0.08	0.60-1.0	0.50-0.70		

Slag Car Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.76	0.075	0.63	0.79	0.56	3.68
2.00	0.030	0.70			
		SUGGESTED ANALYSIS.			
1.75-2.00	under 0.07	under 0.30	0.70-0.90		

Smoke Stacks, Locomotive. (See Locomotive Castings.)

Soil Pipe and Fittings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.00	0.060	1.00	0.60		
		SUGGESTED ANALYSIS.			
1.75-2.25	under 0.09	0.50-0.80	0.60-0.80		

Steam Cylinders, Heavy.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.41	0.092	0.38	0.39		
0.95	0.100	0.30	0.90	0.80	3.40
1.10	0.136	0.43	0.33	0.99	3.30
1.00	0.080	0.20-0.30	1.00	0.75	3.00
1.35-1.50	0.080	0.50	0.75		3.65
1.20-1.40	0.04-0.08	0.40-0.50	0.70-0.80	0.70-0.80	3.00-3.20
0.90-1.20	0.09-0.12	0.20-0.40	0.70-0.90		Under 3.50
		SUGGESTED ANALYSIS.			
1.00-1.25	under 0.10	0.20-0.40	0.80-1.0		low

Steam Cylinders, Medium.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.66	0.065	0.70	0.90		
1.60	0.063	0.72	0.85		
1.70	0.070	0.70	0.75		
1.70	0.075	0.60	0.92		3.50
1.40-2.00	0.085	0.70	0.30-0.70		
1.50-2.00	under 0.08	0.35-0.60	0.50-0.80		
1.40-1.60	under 0.09	0.40-0.90	0.40-0.90		
1.50-1.65	0.080	0.60	0.60-0.70		
1.50-1.80	0.070	0.43	0.76		

Steam Cylinders, Medium—(Continued).

1.85	0.080	0.60	0.50-0.60	0.50	3.25-3.50
1.75	0.100	0.65	0.55		3.40-3.55
1.32	0.136	0.43	0.33	0.99	3.30
1.12	0.085	0.40	0.70	0.70	3.50
2.00	0.100	0.50	0.70	0.40	3.50
2.00	0.070	0.30	0.60		
1.50	0.070	0.75	0.70		3.50
1.59	0.109	0.60	0.38		3.34
1.86		0.29	0.55	0.52	
1.90	0.074	0.50	0.65		
1.56	0.061	0.45	0.78		
		SUGGESTED ANALYSIS.			
1.25-1.75	under 0.09	0.30-0.50	0.70-0.90		

Steam Chests. (See Locomotive Castings and Machinery Castings.)

Stove Plate.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.90		0.73	1.40		
2.59	0.072	0.62	0.37	0.35	3.30
3.19	0.084	1.16	0.38	0.33	3.41
2.75	0.050	1.00	0.80	0.18	3.38
2.79	0.077	1.40	0.32	0.20	3.22
2.51	0.110	0.62	0.41	0.24	3.18
2.76	0.071	0.63	0.63	0.37	3.50
2.76	0.084	0.65	0.54		
2.50	0.060	1.00	0.60		
2.60	0.050	0.60	0.60		
2.50-3.00	under 0.10	0.60-0.80	0.40-0.60		3.00-4.00
		SUGGESTED ANALYSIS.			
2.25-2.75	under 0.08	0.60-0.90	0.60-0.80		

Valves, Large.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.20-1.50	under 0.09	0.35-0.60	0.50-0.80		
1.00	0.100	0.50	0.90		
1.67		0.26	0.45	0.69	
		SUGGESTED ANALYSIS.			
1.25-1.75	under 0.09	0.20-0.40	0.80-1.0		

Valves, Small.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
1.70	0.058	0.50	0.74	1.16	4.18
2.23	0.075	0.67	0.67		
1.75-2.25	under 0.08	0.30-0.50	0.60-0.80		low

Valve Bushings. (See Locomotive Castings and Machinery Castings.)

Water Heaters.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.15	0.050	0.40	0.50		
		SUGGESTED ANALYSIS.			
2.00-2.25	under 0.08	0.30-0.50	0.60-0.80		

Weaving Machinery. (See Machinery Castings.)

Wheels, Large.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.10	0.040	0.40	0.70		
		SUGGESTED ANALYSIS.			
1.50-2.00	under 0.09	0.30-0.40	0.60-0.80		

Wheels, Small.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
2.10	0.050	0.40	0.50		
1.60	0.083	0.60	0.39		
		SUGGESTED ANALYSIS.			
1.75-2.00	under 0.08	0.40-0.50	0.50-0.70		

Wheel Centers. (See Locomotive Castings.)

White Iron Castings.

Silicon, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Manganese, per cent.	Combined Carbon, per cent.	Total Carbon, per cent.
0.50	0.150	0.20	0.17	2.90	
0.90	0.250	0.70	0.50		2.50

Wood Working Machinery. (See Machinery Castings.)

THE BRASS FOUNDRY

American Brass Founders' Annual Convention

THE annual convention of the American Brass Founders' Association, held during Founders' Week in Detroit, June 7-10, was largely attended by melters of the non-ferrous metals from all sections of the United States and Canada. Four meetings were held, and the program was replete with interesting papers on live topics of interest to the progressive foundryman. The majority of the addresses provoked considerable discussion, which developed many points of value not presented in the papers. The increase in membership, as reported by Secretary W. M. Corse, is exceedingly gratifying, the enrollment having shown a growth of nearly 30 per cent during the year.

Opening Session.

The American Brass Founders' Association and the American Foundrymen's Association held a joint session Tuesday morning. Addresses of welcome and responses were made, and after the presidential address of Arthur T. Waterfall, William R. Webster, president of the American Brass Founders' Association, delivered the following address:

"One of the most significant aspects of this industrial age is the rapidity of industrial progress. New machinery, new methods, new processes, appear today to be in turn succeeded by more effective, or more economical ones tomorrow. The maintenance of commercial supremacy demands not only that we be informed concerning the improvements of the hour, but that we examine carefully the means by which progress may be not only maintained, but stimulated.

"A consideration of the subject leads to the conclusion that progress is primarily promoted by increased knowledge. It is through the application of science to art that industrial progress is in great measure achieved.

"If now a comparison is made between the progress of the arts with which we are concerned, it will be found that relatively, to the general rate, we lag somewhat. While the art of founding the non-ferrous metals is one of the oldest known, it can in all truth be said that the progress we have attained leaves much to be desired. How then shall this association promote progress more rapidly, or, so to speak, increase its rate, manifestly by using such agencies as will increase our knowledge of the natural laws on which our art is founded.

Knowledge of Physical Properties.

"Initially we need more knowledge of the physical properties of the metals with which we work that we may increase their uniformity; we need to know the precise effects of the various inpurities with which they are liable to be contaminated, to the end that we may limit the effects of such impurities.

W. M. Corse Compounding Elixirs for Brass Foundrymen

"Much work has already been done in connection with the modern theory of alloys, but very much remains to be done in order that our practice may be influenced by the discoveries already made in this sphere. In fact, the application of the knowledge already gained may be said scarcely to have begun.

"A consideration of the existing literature of the non-ferrous alloys demonstrates that it is to a great extent academic, or at best not closely in touch with current practice. Many researches have been carried on which have yielded much of value. The field has, however, not been covered to an extent sufficient to permit the crystalization of practice into anything approaching standards for alloys for various purposes. In order that this may be accomplished, accurate and authoritative determinations are necessary of the variations in physical properties due to variations in proportion of the various metals employed, both as resulting when the metals are used in the purest commercial forms and as affected by normal and abnormal amounts of beneficial or deleterious impurities. These determinations need to be made not merely on test pieces made only for experimental purposes, but in such a manner as to show results obtainable in ordinary foundry practice. As an important amplification of this knowledge, it is, moreover, essential that accurate information should be obtained which shall indicate the relations existing between physical properties, as determined by the standard physical tests, and the requirements of the manifold uses which commercial employment demands.

"The enormous value of these alloys is in large measure due to the

very great variations in properties obtainable by the possible variations in the proportions in which they may be combined, but we lack knowledge accurately connecting specific properties with specific uses. Combining, as the subject does, considerations of initial cost with those affecting ease and certainty of founding and fabrication, the problem is by no means simple, and will require extensive and careful research for its solution.

"In addition, a wide field for research exists in connection with the problems connected with the founding practice. Accurate knowledge is necessary concerning the variations in physical properties caused by varying mixtures and conditions, by variations in alloying and pouring temperatures. In some mixtures the loss of volatile ingredients occurs to a considerable degree and a thorough understanding of the conditions affecting the magnitude of this loss would be of enormous value. In addition there are many problems concerning the employment of various fluxes, not to mention the multitude of questions as to the best methods of molding, pouring, etc.

Co-operation.

"These being some of the lines along which information is needed for the improvement of our practice, we may inquire how such knowledge can best be obtained, and how this association can to best advantage co-operate to this end. In our membership we can find many individuals and organizations devoting their time to a greater or less extent to the solution of problems such as these, according to the opportunities at their command. Many of them include, within their establishments, departments of greater or less scope, directly devoted to research. Such departments, however, must primarily be governed by commercial considerations which tend on the one hand to limit the field of research to lines which produce immediate commercial results, and on the other hand to restrict publicity. That these considerations, however, do not entirely prevent the communication of invention and discovery, is indicated in the work of this and kindred associations devoted primarily to the advancement and dissemination of technical knowledge, but the broadest research and widest publicity can come only through mutual associations for common purposes, or through sources where commercial considerations do not control.

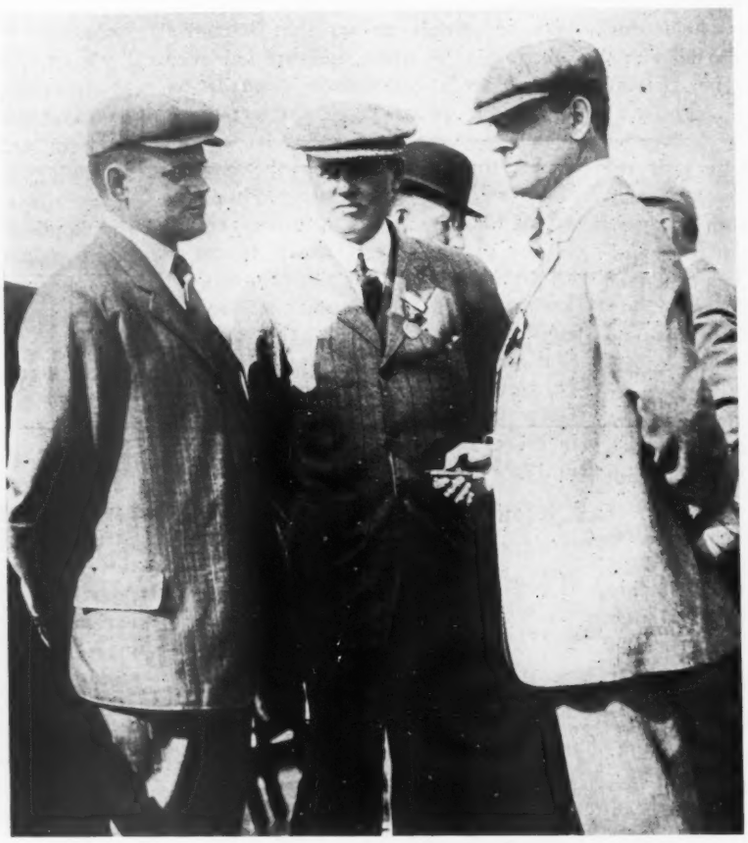
Government Assistance.

"Work of this character, when of sufficiently broad public interest, is now being recognized as a legitimate function of government, as note the activities of the department of agriculture along experimental lines. Such sources exist in the educational institutions which maintain chemical and metallurgical departments in which the processes of the foundry as well as the properties of structural materials are taught. In all of these much attention is devoted both by teachers and instructors to research work. For such as these no more fruitful field of work exists than can be found along the lines here briefly suggested.

"Here, then, in co-operation through this association, with such agencies for research, lies an opportunity to stimulate progress which should be taken advantage of to the fullest extent. Formerly much was heard concerning the pursuit of knowledge for its own sake. The more modern view, however, considers that the purpose of knowledge is its use, and its function the achievement of results.

Technical Education.

"Much criticism has been heard of our system of technical education, more particularly that it lacks direct adaptation to our industrial needs. Such criticism is apt to be dictated by occupancy of narrow and unsympathetic viewpoints not cognizant of all the aspects of the problem, but grounds there are for criticism in the fact that the contact between the educational institutions and the fields of effort for which they prepare, is still somewhat too remote. Technical associations can serve no more useful function than as a medium through which this contact can become more intimate and more extensive. The industries which we represent are but beginning to feel the results of technical education. Before us is the opportunity of insuring that such education, aimed directly at our needs, is alive to our requirements. Particularly should we welcome the educator. With him we should co-operate. To him we should present our problems, not alone that through his opportunities for research he may be instrumental in their solution, but also that we may thereby assist in procuring for our industries educational provisions suited to their needs."



W. M. Corse, Thomas Evans and W. R. Webster, Discussing the Affairs of the American Brass Founders' Association

Secretary's Report.

The following report of the secretary-treasurer was presented by W. M. Corse:

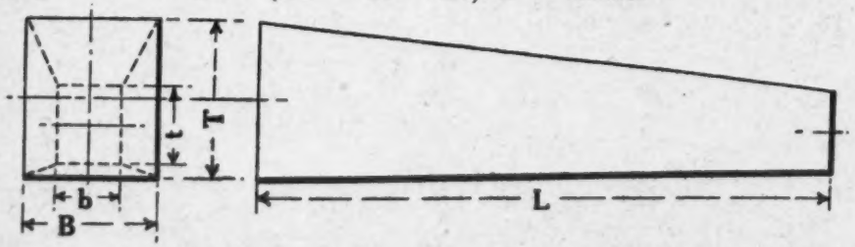
The membership reported at the Cincinnati convention was 206. The number of members up to date is 267, showing a net gain of 29.6 per cent. Your secretary sent out approximately 2,000 letters and our vice presidents also have sent out several hundred. Mr. Olson's circularizing brought in

FORMULAS FOR FINDING THE WEIGHTS OF IRON CASTINGS.

By W. L. Tryon

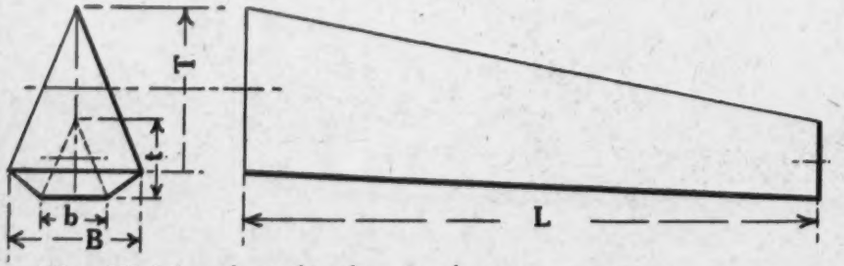
To find the weight of a frustrum of a rectangular pyramid, first find the sum of the products of the breadth of the large base by its thickness, the breadth of the small base by its thickness, and the breadth of the large base by the thickness of the small base; then multiply this sum by the length by 0.0868 and the product is the required weight.

$$W = (BT + bt + Bt)\ L \times 0.0868.$$



To find the weight of a frustrum of a triangular pyramid, first find the sum of the products of the breadth of the large base by its thickness, the breadth of the small base by its thickness, and the breadth of the large base by the thickness of the small base; then multiply this sum by the length by 0.0434 and the product is the required weight.

$$W = (BT + bt + Bt)\ L \times 0.0434.$$



W = Weight of casting in pounds.
B = Breadth of large base in inches.
T = Thickness of large base in inches.
b = Breadth of small base in inches.
t = Thickness of small base in inches.
L = Length of casting in inches.

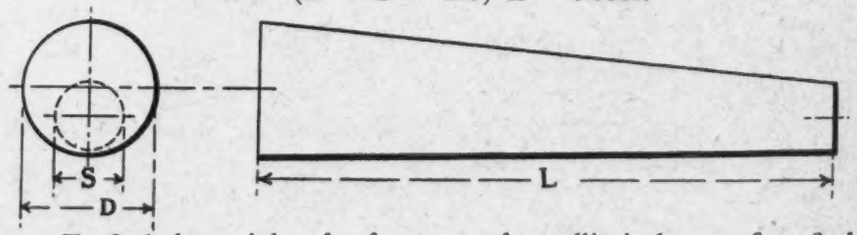
Data Sheet No. 69, The Foundry, July, 1910.

FORMULAS FOR FINDING THE WEIGHTS OF IRON CASTINGS.

By W. L. Tryon

To find the weight of a frustrum of a circular cone, multiply the sums of the diameter of the large base squared, the diameters of the small base squared and the product of the two diameters, by the length, by 0.0682.

$$W = (D^2 + S^2 + DS)\ L \times 0.0682.$$



To find the weight of a frustrum of an elliptical cone, first find the sum of the products of the large diameter of the large base by its small diameter, the large diameter of the small base by its small diameter, and the large diameter of the large base by the small diameter of the small base; then multiply this sum by the length by 0.0682 and the product is the required weight.

$$W = (Dd + Ss + Ds)\ L \times 0.0682.$$

W = Weight of casting in pounds.
D = Diameter of large circular base or large diameter of large elliptical base in inches.
d = Small diameter of large elliptical base in inches.
S = Diameter of small circular base or large diameter of small elliptical base in inches.
s = Small diameter of small elliptical base in inches.
L = Length of casting in inches.

Data Sheet No. 70, The Foundry, July, 1910.

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note-book form.

THE FOUNDRY DATA SHEET, JULY, 1910.

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication.

good results. We have added to our list a number of prominent scientific men, who ought to strengthen our membership considerably. Our president, Mr. Webster, has written a number of letters to the various educational institutions, with an idea of interesting their scientific men in our organization.

I also want to call attention to the help we have received from the committee on papers, of which Mr. Patch is chairman. The program, I think, will testify to the good work done in this regard. We have also received considerable help from the Detroit committee on papers and wish to acknowledge the interest that they have shown in preparing our sessions.

The standardization committee, appointed at last year's meeting, has gotten under way, and its report shows that some good work is being done in connection with the bureau of standards at Washington. I would like to suggest at this point that our association co-operate with the American Chemical Society and the American Society for Testing Materials, in this matter of standardization of methods for analyses of non-ferrous alloys, and your secretary plans to keep in close touch with these organizations so that the maximum benefit may be derived from this work.

In conversation with the chairman of the Industrial division of the American Chemical society, it was suggested that our association appoint a committee on the definition of trade terms, to co-operate with a similar committee from that society. I would recommend that some step be taken at this meeting to carry this into effect.

I also want to call attention to the publications of the abstracts from the American Chemical Society, a portion of which were published in this year's transactions. The period covered was from July 1, 1909, to January 15, 1910. Through the kindness of the American Chemical Society, we were enabled to copy their metallurgical abstracts from their journal, which gives us a means of furnishing our members with this information, without the enormous amount of work which this sort of thing generally takes. As far as I have been able to find, these abstracts have met with approval. If the association feels that the work is worth while, I would suggest following it up along the same lines as last year. I fully realize the value of longer abstracts and editorial comment in connection, but my work has been such as to make it impossible for this to be carried out.

I also want at this time to acknowledge our indebtedness to our good friend, Dr. Moldenke, for the large amount of help that he has given us in connection with the distribution of our transactions, and for the number of little details that he has carried out for our association.

If the tenor of the letters that your secretary has received in the last month is any indication, it would seem that the future of the American Brass Founders' Association is certainly assured, and with the same type of men on our executive committee, we can hope for very valuable results during the next few years.

Financial Report.

Receipts:—		
Balance reported at Cincinnati convention		$ 18.00
Received for dues		1,162.50
Interest		2.00
Total		$1,182.50
Disbursements:—		
Bond for treasurer	$ 5.00	
Institute of Metals Membership	10.50	
Office supplies	.60	
Postage	123.70	
Salary 1908-09	98.75	
Salary 1909-10	420.00	
Printing	423.85	
Stenographer, Cincinnati convention	37.00	
	$1 119.40	
Cash on hand, May 28, 1910	63.10	
Total		$1,182.50

Tuesday Afternoon.

"Fluxes as Applied to the Brass Foundry," was the subject of the first paper, presented by Irwin S. Sperry, Tuesday afternoon. In discussing this paper, Mr. Corse asked what value bi-carbonate of soda presented as a flux for brass. Mr. Sperry replied that he had never used it and could see no advantage from its employment as a flux, as it is so basic that it has a strong action on the crucible. In reply to a question as to what flux is used for white metals, Mr. Sperry said that tallow and chloride of zinc are both employed. W. M. Corse, referring to the action of bi-carbonate of soda and the manner in which it is decomposed by heat, ventured the opinion that it should possess value as a flux, and believed that it was so used in some cases.

N. K. B. PATCH, PRESIDENT OF THE AMERICAN BRASS FOUNDERS' ASSOCIATION

Mr. Sperry added that he had no experience with bi-carbonate of soda, and added that salt was the only flux used in the Naugatuck valley. Salt possesses such a strong deoxidizing value that it is used in determining the quantity of oxide in copper, and he was of the opinion that Mr. Carpenter, of the Metal Dross Economy Co., was the first to use salt in melting brass. Mr. Carpenter replied that Mr. Sperry was in error, and that salt was first used by a foundryman named Haley. He recommended the plentiful use of fine charcoal, and for the cheaper grades of yellow brass, such as contain six parts of zinc and ten parts of copper, etc., he said that salt is no better than so must dust. However, when salt is used it should be applied at a red heat, when the copper sweats, and not after it is melted, nor when the metal is charged. Rock salt is to be preferred to the granulated variety as it possesses qualities not found in the latter. Mr. Sperry insisted that salt is salt, and said that it would be difficult to find any advantage from the use of rock salt, other than cheapness. Another speaker stated that he had used rock salt and found that it gave the best results. He was surprised to learn that there were any foundrymen who did not use charcoal, as he was using wood with very good results.

Use of Plaster of Paris.

Regarding the effect of the use of plaster of Paris on copper, Mr. Sperry replied that it is a useful flux on brass, especially in smelting skimmings, etc., that it will remove small amounts of iron, but that it cannot be expected to take the place of a magnetic separator especially designed for this purpose. The discussion developed the fact that salt and charcoal are most generally employed in melting brass, and the charcoal is considered indispensable by experienced brass founders.

Costs and Cost Systems.

"Costs and Cost Systems Applied," was the subject of a paper presented by C. R. Stevenson, New York City. Harrington Emerson did not agree with the methods advocated by Mr. Stevenson. Mr. Carpenter asked how the shrinkage was figured in melting brass, stating that it was a factor which could not be overlooked, and he desired to learn what would be considered a fair average for copper and brass. Mr. Stevenson replied that this had been provided for in the cost system outlined. Mr. Carpenter then asked how many pounds of good castings he should have from a charge of 10 pounds of metal in the furnace. Mr. Stevenson failed to advise him on this point. Mr. Car-

penter stated further that in his experience the shrinkage of metal averaged 2 per cent, and he then took exception to Mr. Emerson's statement that "costs have no bearing on the selling price." Mr. Held, of Milwaukee, stated that covering a period of two years in the manufacture of plumbing goods, the shrinkage, in the foundry with which he is connected, averaged 2.60 per cent, and dropped as low as 1.90 per cent. The mixture used consisted of copper 78 per cent, zinc 15 per cent and lead, 7 per cent. This small shrinkage included skimmings. Another speaker said that he maintained a careful record of the shrinkage during the past year, and that it averaged 3.42 per cent, but these figures included the shrinkage of 25 tons of borings, which somewhat increased the average loss. Mr. Corse then asked what the percentage of good castings should be per hundred pounds of metal, that is, if 100 pounds of metal are melted, how many pounds of castings should be delivered to the cleaning room. The speaker to whom this question was addressed was unable to answer, as he had not come prepared with data on this subject. Mr. Sperry stated that shrinkage is an unknown quantity, as it is liable to wide variations, and compared it to the practice of making a uniform price on castings.

Wednesday Morning.

A communication was read from Charles H. Proctor, on behalf of the National Electroplaters' Association of the United States and Canada, regarding their inability to co-operate with the brass manufacturers in their annual convention, and expressing the hope that they would be in position to participate in the future, to demonstrate how they can beautify and adorn what the brass foundry had created.

Electric Furnaces.

Prof. J. W. Richards, South Bethlehem, Pa., delivered an interesting address entitled "The Electric Power Required to Melt Brass, Bronze, Etc." He spoke of the heat efficiency of the various fuels, and the amount of energy that is lost in conveying heat to the metals with the various types of furnaces in use, as compared with the efficiency of electric power for the same purpose. When melting brass he contended that the greater part of the heat escaped through the flue, the efficiency of the furnace averaging from 5 to 10 per cent. When melting steel in crucibles, about one-fortieth of the total heat generated is available. The crucible process, he said, is the most wasteful method of melting metals, the reverberatory furnace showing greater efficiency. This is due to the fact that the crucible is a poor conductor of heat. The reverberatory furnace, he said, has an efficiency of from 10 to 15 per cent, this percentage of the total heat generated being absorbed by the metal.

Regenerative Furnaces.

The efficiency of the regenerative furnace is still higher, averaging from 25 to 30 per cent, which is due to the absorption of waste heat by the regenerators. The most efficient method of melting in general use is the cupola, as the metal is in direct contact with the fuel and the efficiency of this type of furnace is from 25 to 40 per cent. On the other hand, the efficiency of the electric furnace is from 50 to 90 per cent, the average being, approximately, 75 per cent. The speaker then discussed the latent heat of metals, and referred to the amount of heat absorbed by different metals at various stages of melting. He stated that the latent heat of aluminum is 20 to 25 per cent greater than that of ice, and that it is necessary to superheat the metal 10 per cent to keep it sufficiently liquid to carry to the molds. The latent heat of fusion is the amount of heat absorbed at a certain stage of melting when heat is apparently lost, as it produces no rise in the temperature of the metal. In the case of copper, he said that when the metal reaches a red heat and begins to sweat, it will remain in this condition for a considerable period before it melts. Up to this point it has been steadily growing hotter, although there is no apparent rise in temperature, notwithstanding the fact that the heat is steadily applied, and is absorbed by the metal without result, until a certain amount has been taken up, when the copper grows hotter and becomes liquid.

Latent Heat of Metals.

The latent heat of fusion was stated by Dr. Richards to vary as much as 20 per cent in the different metals. The amount of heat required to melt one pound of brass is 234 British thermal units, and with coke at an efficiency of 100 per cent, one-fiftieth of a pound would melt one pound of brass. At the present cost of electric power it is more expensive than either coal or coke for melting brass, but for melting steel it is sometimes cheaper, being more effective at high than at low temperatures. Therefore, the ideal method of melting would be to use fuel to heat the metal to the point at which it begins to absorb heat, and then to apply the electric current to raise it to a higher temperature.

In the ensuing discussion, Mr. Karr stated that he was using 7½ pounds of coke to melt one pound of bronze. Dr. Richards replied that this represented an efficiency of 17½ per cent, which is very high for crucible furnaces. Dr. Richards was then asked whether a combination furnace could be designed for the use of both fuel and electricity, and replied that at the Homestead Steel Works of the Carnegie Steel Co., a 20-ton electric furnace is being experimented with that employs both gas and electricity.

Thursday Morning.

After the appointment of the nominating committee, Jesse L. Jones, of Pittsburg, presented a paper entitled, "The Selling of Brass Foundry Refuse." The speaker was asked whether it was more advantageous to sell such material than to reclaim it, in foundries where large quantities of this refuse are produced. Mr. Jones replied that great savings could be effected by separating the various grades of brass turnings, etc., instead of mixing them promiscuously, and added that the firm with which he is connected had experienced much difficulty in accomplishing this until a plan was adopted of crediting the machine shop foremen with only 5 cents per pound for mixed and dirty turnings, and 15 cents per pound for clean, separated turnings. This solved the problem, as each foreman was desirous of obtaining the greatest possible credit, and was careful to supervise the separation of the various grades of scrap. Mr. Reisenbach stated that it would be found to be very expensive to install a modern recovery plant, that it would have to be constantly kept in operation to pay interest on the investment, and consequently a concern having such a plant would have to bid for outside material. In this way the firm would enter into competition with the scrap metal dealer, and would soon find itself engaged in a new line of business.

Co-Operative Course in Metallurgy.

Frank T. F. Stephenson then delivered an address on "The Value of the Association to Its Members." This was followed by the following paper entitled "A Co-operative Course in Metallurgy," by Dr. J. J. Porter:

There are two recognized raw materials for the production of foundrymen molders and engineering graduates. The first material is the usual one and has many things to commend it. It usually produces a good executive, thoroughly grounded in all the details of foundry work, and defective only as regards ability to cope with unusual difficulties, this being due to narrow training and lack of grounding in the funda-

mental scientific principles underlying foundry work.

The second material usually fails to produce anything, since the average college graduate, filled with the idea of his own importance and dignity, cannot place himself on a level with the apprentice boy and ask questions of a common molder. Hence, he usually fails to learn the practical details of the business, and if he stays at all, it is in the capacity of an engineer, chemist or office man and not as a shop executive.

Co-Operative Engineering Course.

Evidently the ideal training for a foundryman should include both that of the molder and of the technical graduate, and it is along this line that we, at the University of Cincinnati, are trying to work out the problem. A brief word in explanation of our co-operative engineering courses is now in order. This system, the idea of Prof. Herman Schneider, now dean of our College of Engineering, was first put into practice four years ago, being applied at tha time to students of mechanical, electrical and chemical engineering. Since then it has also been applied to civil engineers, and this summer we inaugurate a co-operative course in metallurgical engineering.

The system is briefly as follows:

First.—A careful system of selection is used whereby we get a high average quality of raw material to educate. In this selection both the university and the shop have a part.

Second.—The students selected, work at the university and the shop on alternative weeks.

Third.—The students are grouped into pairs, members of which alternate with each other in the shop and the university. In this way both the shop and classrooms are always manned.

Fourth.—A student while in the shop does exactly the same class of work as a regular apprentice and is subject to the regular shop discipline. He is not petted or given a white collar job, and, if fired from the shop, also ceases to be a student of the university.

Fifth.—The student is paid for his work in the shop at the rate of 10 cents per hour at the start and with an increase of 1 cent per hour each six months.

Sixth.—A shop schedule is arranged between the university and shop authorities and in accordance with this the student is moved forward through the various departments of the shop at stated intervals. This schedule is not inflexible and may be varied according to the convenience of the shop and the capabilities of the student, but it is not contemplated that the student shall be kept continuously on only one class of work.

Seventh.—The student's school work is identical in standards with that given in all high grade engineering schools. While some features have been added, nothing is omitted except the shop instruction and certain laboratory courses which would be but a duplication, or rather, a poor imitation, of the experience the boys are getting in the shop.

Eighth.—The course as now given is six years in length, but beginning next year it is proposed to operate the university eleven months of the year in place of nine months, and to cut down the length of the course to five years.

Importance of Shop Work.

I wish to call special attention to the fact that our system differs from all other partial time schools, in that the shop work is an integral part of the training and is closely co-ordinated with the class work.

The course in metallurgical engineering, which we are just putting into operation, is designed to turn out men broadly trained in the fundamentals of metallurgy and engineering, and since most of them will receive their practical training in foundries, we expect that a large proportion of them will become foundrymen. In view of this fact, we shall lay particular stress upon foundry metallurgy in the instruction which we give, and the whole course is planned with a view to turning out production engineers or shop executives, rather than metallurgical chemists, draftsmen or designers.

The course of study as planned, includes the fundamental sciences, chemistry, physics and geology, mathematics, the elements of mechanical and electrical engineering, mechanical drawing, and, of course, metallurgy. In addition, we include certain cultural studies such as English, history, economics, and a modern language with the idea that the broader mental vision thus given will add to the student's ultimate pleasure in life as well as increase his value as a citizen.

Analytical chemistry is not strongly emphasized since it is not our intention to turn out analysts. However, we do expect to give them enough of this to enable them to make the usual determinations required in the routine operation of the foundry. We believe that some of the shops co-operating with us will be glad to take advantage of the opportunity afforded to have occasional analyses made, when they learn of the ability of the students and are informed that the cost of fitting up a laboratory need not exceed $100.00. We should, however, oppose any tendency to keep the student permanently employed on this class of work.

Course in Metallurgy.

Regarding the teaching of metallurgy, or metallurgical engineering, as we prefer to call it, the work is planned with a view to emphasizing correct methods of reasoning and the scientific solution of practical problems rather than the memorizing of text-books or lectures. To this end, in conjunction with the instructions of the class room, individual students will be assigned problems or tasks of a practical nature to be solved and reported upon. These problems may require work in the library, drawing room or laboratory, and, at times, perhaps, visits to other plants and correspondence with manufacturers. They may vary from very simple tasks for beginners to quite difficult ones for the advanced students, and would include such diverse subjects as the making of working drawings for a cupola, the investigation of the shrinkage of a pattern metal, the estimation of the cost of making certain castings, and the selection of the best type of molding machine for a given job. It is confidently expected that the shop experience of the student will suggest a large number of these tasks or problems.

In the opinion of the writer, the most interesting and valuable feature of this course is the shop co-ordination work which has for its object the taking of the blinders off the boy, helping him to see the real meaning of the operations going on about him in the shop and giving him the maximum benefit from the shop experience.

The writer, having charge of this end of the work, will spend several afternoons a week in visiting the shops in which the students are employed, noting the jobs upon which they are at work and the various things going on about them. The student is not interrupted in his shop work, but the next week at the university the various points connected with his work are explained and made the basis for a general discussion.

Practical Instruction.

For example, if he has been on the cupola platform weighing charges, the subject of pig iron may be taken up. The characteristics of the various brands, as affected both by chemical composition and the conditions of manufacture will afford a profitable field for discussion. At another time the theory of the cupola may be explained, the heat balance being calculated and the relation between gas composition and fuel economy discussed. If the student has been pounding cores the subject of core binders and core sands may be taken up from both the scientific and the practical points of view, while if he has been working on a molding machine the general subject of type and construction of molding machinery will afford ample material for several weeks' discussion.

In all of this work an effort will be made to introduce the student to the best literature of the foundry, especially the current literature as represented by the foundry journals and the transactions of the foundrymen's associations.

The great value of this feature of the work is self-evident, for not only does it enable the student to better understand shop methods and processes, but it stimulates his interest in his work and helps to cultivate in him habits of observation.

In conclusion, I wish to say that although our course in the production of foundrymen is but now being started, these same principles have had a four years' trial in the case of mechanical, electrical and chemical engineers. The results here have been exceedingly successful from the combined standpoints of the shops, students and university. In proof of this I may say that this co-operative system is receiving the enthusiastic support of the Cincinnati Metal Trades Association and that we are in danger of being robbed of some of our students through the shops being unwilling to wait for their graduation to have their full time.

In view of this record and of the cordial co-operation of nearly a dozen of the leading foundries of Cincinnati and

vicinity, we feel that our success is assured.

Thursday Afternoon.

"Modern Foundry Progress" was the first paper read on Thursday afternoon, by Charles T. Bragg, Mansfield, O. Hugh McPhee, Tarrytown, N. Y., then explained a new method of mounting patterns of uneven parting for use on molding machines. A master pattern is first made in wood, and from this as many white metal patterns are cast as will be used on the match-plate. After being finished the mold is made by hand, great care being exercised to obtain a perfect parting and to secure properly proportioned gates. The two halves of the mold are then placed side by side, with the joint uppermost, and white metal is poured into the depressions made by the patterns, and when cool the match-plate frames are closed over the mold, and are filled with a composition consisting of cement and plaster of Paris. This produces cope and drag match-plates which can be used on molding machines to advantage. Several match-plates were shown, from which a large number of molds had been made.

The novelty of this method lies in the manner of running the white metal portions to overcome the shrinkage problem. If the metal parts of the plate were poured at one operation, the patterns would be smaller by the amount of shrinkage of the metal. To overcome this, Mr. McPhee casts the patterns in sections, filling the deep portions first, and to confine the liquid metal to the desired sections he cuts up one of the old metal patterns and places sections in the mold to act as stops, afterward removing them and filling the places they occupied with metal. In this way all projecting portions of the match-plates are made of metal, and they are held in place by the composition with which the match-plate frame is filled.

Discussion of Match-Plate Process.

Mr. McPhee was asked the mixture of the white metal used, and he replied that it consisted of 15 parts of tin to 1 part of antimony. Another speaker desired to know what was done in the case of deep sections, and Mr. McPhee replied that these were cored out to reduce the weight of the match-plate and to save metal. When the metal part of the plate is run the core is left in place and the composition is poured over it. Mr. McPhee was also asked regarding the pouring of the metal face when the flask has an irregular parting. He stated that he raised or lowered the flask until the part to be poured was level, when stops were applied where necessary, and only that portion poured. After this the flask was tilted in any desired direction until all sections had been cast, when the composition was run in place.

Standardization of Brass Analyses.

A paper entitled "The Determination of Lead in Non-Ferrous Alloys," was read by C. P. Karr. The secretary read the progress report of the committee on standardization of brass analyses, prepared by Dr. W. F. Hillebrand, chief chemist of the bureau of standards, Washington. The report is, in substance, as follows:

"The committee has decided to furnish the bureau, as its first samples, the two following brasses: One red, containing copper, tin, lead, zinc, antimony, aluminum, iron and a little manganese; yellow brass containing copper, tin, lead, zinc, iron and nickel. The sample of red brass, weighing 98 pounds, was furnished by the Lumen Bearing Co., Buffalo, in the form of small ingots, to avoid segregation as much as possible. The sample of yellow brass, weighing 145 pounds, was furnished by the Bridgeport Brass Co., Bridgeport, Conn. The sample of red brass awaits the construction of a suitable crusher, and after crushing there must be a thorough mixing. Each sheet of the yellow brass will require careful cleaning, and must then be reduced to chips. A machine is now being constructed to insure thorough mixing without contamination, and without such heating as would cause oxidation. The final determination will be made by the co-operation of a number of chemists."

It was stated that it will be several months after the sample is ready for analysis before it can be distributed by the bureau.

Election of Officers.

The president was instructed to appoint a committee on trade terms, after which the officers for the ensuing year were unanimously elected as follows:

President: N. K. B. Patch, Lumen Bearing Co., Toronto.

Vice presidents:

Pennsylvania, Delaware, Maryland and District of Columbia: Thomas Evans, Eynon-Evans Mfg. Co., Philadelphia.

Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island; rolling mill section: W. H. Carpenter, Bristol Brass Co., Bristol, Conn.

Brass foundry section: Richard Augenbraun, Yale & Towne Mfg. Co., Stamford, Conn.

New York and New Jersey: W. L. Abate, Nathan Mfg. Co., New York City.

Michigan, Ohio and Indiana: L. W. Olson, Ohio Brass Co., Mansfield, O.

Illinois (except City of Chicago), Missouri, Kansas, Colorado, New Mexico, Utah, Arizona, Nevada and California: J. N. Gamble, National Tube Co., Kewanee Works, Kewanee, Ill.

City of Chicago, Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Idaho, Nebraska, Montana, Wyoming, Washington and Oregon: John Wolff, L. Wolff Mfg. Co., Chicago.

Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Indian Territory, Texas, Kentucky and Tennessee: J. Cessna Sharp, J. C. Sharp Brass Works, Chattanooga, Tenn.

Ontario and Western Provinces of Canada: Murray Woodbridge, General Brass Works, Toronto, Can.

Quebec and Maritime Provinces of Canada: Richard R. Mitchell, Robert Mitchell Co., Ltd., Montreal, Can.

Secretary-treasurer, W. M. Corse, Lumen Bearing Co., Buffalo, N. Y.

CONVENTION OF AMERICAN FOUNDRYMEN.

(Continued from page 235.)

further knowledge of the advancements in the art. The local organizations afford him the means and in turn the national body being selected from the farthest advanced in the craft, affords him, in its annual gatherings, the opportunity to acquire further knowledge.

"It is interesting to note the results of these annual gatherings and their effect upon the foundry foremen who attend. It is noticable that the interest is growing each year in the annual exhibits of the Foundry & Manufacturers' Supply Association, and the discussions of papers read at the conventions. They are becoming broader-minded and more progressive each year.

"Occasionally we hear of slight disturbances in local bodies, and invariably it is caused by allowing discussions appertaining to local competition or labor matters to enter. This should not occur, as there are other bodies to take care of these subjects. Our society should adhere strictly to the broad lines of self-education for the individual, and nothing appertaining either to protective or defensive measures should be allowed to enter. Neither should it be made the base of commercial advancement of any one class of men. Our meetings should be held at all times with open doors, and the discussions of all papers should be open to all, whether employer or employe.

"It is to be hoped that in the near future there will be a local body in each of the larger cities of the United States, and that every foundry fore-

man will feel it an honor to become a member."

Other toasts were responded to as follows:

"The Detroit Foundrymen's Welcome," Frank T. F. Stephenson; "The American Foundrymen's Association," Arthur T. Waterfall and Joseph T. Speer; "The Foundrymen's Questions," Dr. Richard Moldenke; "The American Brass Founders' Association, W. R. Webster; "The Foundry and Manufacturers' Supply Association," F. N. Perkins; "The Detroit Foundrymen's Association," J. J. Wilson; "Our Canadian Cousins," L. L. Anthes.

On Tuesday evening a smoker was given by the Detroit Foundrymen's Association at the Light Guard Armory, and on Wednesday afternoon the visitors enjoyed a boat ride on the Detroit river. Stops were made at the Semet-Solvay coke oven plant and at the blast furnaces of the Detroit Iron & Steel Co. After dinner there was a moonlight ride on the river. The ladies' entertainment included a theater party at the Temple on Tuesday evening, and an automobile sight-seeing trip through Detroit Thursday afternoon. The plant visitation committee was busily engaged throughout the week in directing the foundrymen to the various shops which welcomed delegations. A folder was published showing a plan of the city, and which contained a list of the works to which access could be obtained.

Associated Foundry Foremen.

At the annual meeting of the Associated Foundry Foremen, Robert B. Thomson, of the Buffalo Pitts Co., Buffalo, was elected president. He was instructed to appoint a committee of three to select a secretary and Hugh McPhee, of the Maxwell-Briscoe Co., Tarrytown, N. Y., was selected. Charles Wiltshire, General Electric Co., Schenectady, N. Y., was appointed first vice president. Mr. Thomson, who was elected president, has been connected with the foundry trade for many years and is now foundry superintendent of the Buffalo Pitts Co. During convention week more than 200 new members were enrolled. The Associated Foundry Foremen is an educational organization and in no way deals with the labor problem.

DETROIT EXHIBIT OF FOUNDRY EQUIPMENT.

(Continued from page 237.)

Trustees: F. N. Perkins, Arcade Mfg. Co., Freeport, Ill.; H. M. Boughter, J. W. Paxson Co., Philadelphia; E. H. Stedman, Curtis & Co. Mfg. Co., St. Louis.

Secretary, C. E. Hoyt, Chicago.

Treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburg.

The report of the nominating committee was presented by E. A. Pridmore, Chicago, and the other members of the committee were E. H. Mumford, Martin L. Heyl, W. C. Sly and John C. Pangborn.

The salary of the secretary was increased to $2,000 a year, and C. E. Hoyt is to be paid on this basis beginning October, 1909. The salary of the treasurer was increased to $200 a year. To the untiring efforts of Mr. Hoyt the success of the Detroit exhibition is largely due. During the three weeks preceding the convention many booths in the exposition buildings had to be removed, and in one building temporary floors had to be laid. Notwithstanding the many difficulties which are always attendant upon large affairs of this kind, all of the exhibits were in position at the time of opening the show.

The molding machine display was notable, especially as considered from the standpoint of novelty. Many of these labor-saving devices, perfected during the year, were shown for the first time, and many foundrymen marveled at the speed of production of the large automatic machines. Judging from the size of the molds made on the jarring machine displayed, there seems to be no limit to the size of the copes and drags that can be rammed in this way. The number of molding machines exhibited totalled 112, and there were no less than 73 different styles and sizes. The practice of ramming cores on molding machines is also growing rapidly, which was shown by the number of machines displayed for this work, and for making small, standard cores, a number of ingenious machines were exhibited.

The display of non-ferrous melting furnaces attracted the attention of the brass foundrymen, while core ovens, ladle heaters, dryers and torches for lighting cupolas, were shown in operation. The rapidity with which some of the exhibits were put in place was marvelous, considering the inclement weather prevailing the week before the show was held. Owing to a freight wreck, the molding machines for the exhibit of the Herman Pneumatic Machine Co., Pittsburg, were not delivered to the Fair Grounds until 3 p. m. Tuesday. Four large jarring machines had to be installed and pits for the foundations had to be dug, and despite the large amount of work that had to be done, the machines were ready for operation when the exposition was opened Wednesday morning.

A MUSEUM FOR METALS AND ALLOYS.

A pathological museum for specimens of metals and alloys has been established at the offices of the Council of the Institute of Metals in London, England, the first contributions having been received from the president, Sir Gerard A. Muntz. This museum, which is the only one of its kind, should be of great service to all interested in the metallurgy of the non-ferrous metals, as it is intended that it shall contain specimens showing the various ways in which such metals as copper, brass, aluminum, etc., can fail, either as a result of faulty manufacture or improper usage.

CAST IRON PLUGS FOR PIERCING BILLETS.

By N. W. Shed

Question:—We would like to have the analysis of cast iron plugs used for the second piercing of billets for seamless tube manufacture. These plugs are subjected to a high temperature and rapidly deteriorate. They are approximately 3½ inches in diameter, 4 inches long, and have a 1-inch core. They are cast in green sand. What should be the silicon, manganese and sulphur content of an iron for this purpose? Will a 10 per cent steel scrap charge make the plugs too brittle and hard? No machining of the plugs is necessary.

Answer:—The cast iron plugs for this work should be quite hard. It is possible to make a mixture that will give a slight chill on the surface of the castings when poured into green sand. The analysis of this mixture should be as follows: Silicon, 1.20 per cent; sulphur, 0.07 to 0.10 per cent; phosphorus, 0.20 to 0.30 per cent; manganese, 0.40 to 0.50 per cent.

The mixture can be made as follows: Malleable pig iron (silicon 1 per cent), 30 per cent; No. 2 pig iron, 30 per cent; car wheels, 10 per cent; steel scrap, 10 per cent; machinery scrap, 20 per cent. A cheaper mixture could be made of car wheels, 40 per cent; No. 2 pig iron, 40 per cent; steel scrap, 10 per cent; machinery scrap, 10 per cent. This mixture, however, would not withstand the high temperature to which these cast iron plugs are subjected as well as the one previously given. When casting these plugs, it might be advisable to try a test in damp sand. If they are too hard, a small amount of ferro-silicon can be added to the metal. The next heat can be made with a greater or smaller content of soft pig iron. If these plugs can be made of low phosphorus iron, they will resist the high temperatures much better. Charcoal pig would be an advantage if the cost were not too high.

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Trade Outlook

The declining tendency of the pig iron market does not reflect trade conditions in the foundry industry, as the gray iron shops throughout the country are operating at capacity. Nor have prices been affected by the low values for raw material, and in jobbing work quotations are higher than they have been at any time during the last 12 months. New low levels have been touched by pig iron during June. In the south, No. 2 foundry, for prompt shipment, has sold at $11.50, Birmingham, and for the last quarter, furnace operators are holding for $12.00. In the Chicago district, local No. 2 commands $16.75, and at Pittsburg heavy sales have been made at $15.65. Other quotations follow: Lake Superior charcoal, $18.50, Chicago; malleable Bessemer, $15.90, Pittsburg; basic, $15.65, Pittsburg; No. 2 foundry, Philadelphia, $16.75; Cleveland, $15.40; Buffalo, $15.50; New York, $16.25. Steel foundries, especially those engaged on heavy work for the railroads and rolling mills, are operating at capacity, and difficulty is experienced in obtaining skilled molders. The pressure on the brass and aluminum foundries to meet the requirements of the automobile trade is not as great as early in the year, although a resumption of activity is promised in August, when the motor car builders begin to manufacture for the 1911 season.

PERSONAL.

J. H. Dalton has been appointed general superintendent of the George H. Thatcher Co.'s foundry, Albany, N. Y.

S. H. Standish, formerly with the Finished Castings Co., Philadelphia, has been elected secretary-treasurer of the Racine Steel Castings Co., Racine, Wis.

Neil J. Frederickson, formerly foreman of the Kelly & Jones Co., Pittsburg, has accepted a position as brass foundry foreman of the Detroit Lubricator Co., Detroit.

Dr. Richard Amberg, formerly with the American Steel Foundries, Indiana Harbor, Ind., has accepted a position with the Crucible Steel Company of America, Pittsburg.

Frank P. Lund, for the past nine years general foreman of the Lumen Bearing Co., Buffalo, has been appointed general manager of the Lundhaven Brass Foundry Co., of that place.

Horace Marr, foreman molder of the John Wright & Eagle Range Works, Ltd., Aston, England, recently resigned to become foundry foreman of the Yew Tree Foundry, Hollingwood, Lancashire, England.

The Pawling & Harnischfeger Co., Milwaukee, designer and builder of electric cranes and hoists, has recently appointed Albert B. Bowman, 720 North Second street, St. Louis, special sales agent.

W. Mayer, until recently connected with the De Soto Foundry & Machine Co., Mansfield, La., is now associated with the Whiting Foundry Equipment Co., Harvey, Ill., in the capacity of steel foundry expert.

William J. Casey, formerly manager of the General Screw Co., Chicago, and later superintendent of the Chicago Steel & Brass Works, has accepted a position as superintendent of the Chicago-Racine Aluminum, Brass & Iron Works, of Chicago and Racine.

George B. Vance, for nine years assistant manager of the Gates Iron Works, Chicago, and recently president and manager of the Chicago Steel & Brass Works, has become connected with the Chicago-Racine Aluminum, Brass & Iron Works, Chicago, as its president and general manager.

J. N. and Mrs. Battenfeld will sail for Europe on the steamer Deutschland, on Saturday, July 2. Mr. Battenfeld is general manager of the Berkshire Mfg. Co., Cleveland, and while abroad will visit practically every country in Europe in the interest of the extensive line of molding machines manufactured by this concern.

Otto C. Plessner, manager of the Chicago office of the Orenstein-Arthur Koppel Co., Pittsburg, has severed his connection with that concern and will open an office at 30 Church street, New York City, as manufacturers' agent for a number of concerns in the west and central west. Mr. Plessner was identified with the Orenstein-Arthur Koppel Co., for 18 years.

L. I. Wightman, for the past six years advertising manager for the Ingersoll-Rand Co., 11 Broadway, New York City, has tendered his resignation to take effect August 1. He will open an office in New York City as an independent specialist in machinery advertising, and will handle the accounts of manufacturers of machinery and engineering products. Owing to his wide experience in handling some of the largest advertising accounts in the machinery field, Mr. Wightman is well qualified for the new line of work which he has undertaken.

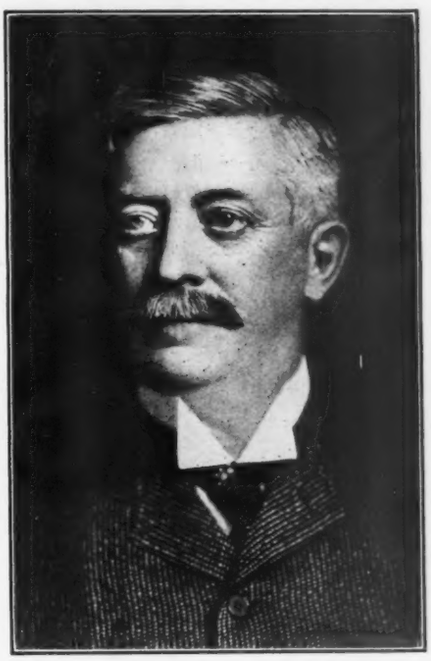
OBITUARY.

Frederick W. Sivyer, president of the Northwestern Malleable Iron Co., and vice president of the Chain Belt Co., of Milwaukee, died Saturday, June 11, at his home in that city after a brief illness. Death was due directly to complications arising from injuries sustained in a fall from a horse at Hot Springs, Ark., where he had gone for his health. Mr. Sivyer was a prominent iron manufacturer of the middle west, and was born in Milwaukee in 1848, his first connection with the iron business being in 1873, when he entered the employ of the old Minerva Furnace Co., now operated by the Thomas Furnace Co. In 1875 he started a malleable iron foundry under the firm name of Harris & Sivyer, which was ultimately transferred to William H. Osborn, of the Wisconsin Malleable Iron Works, with which concern Mr. Sivyer was identified until 1882, when he organized the malleable iron business of Elmore, Sivyer & Co., which, in 1888, was incorporated as the Northwestern Malleable Iron Co. This concern prospered from the beginning, and is now one of the largest plants of its kind in the country. Mr. Sivyer was one of Milwaukee's most public spirited men, and was instrumental in the organization of the Milwaukee School of Trades, and was at one time president of the Merchants' and Manufacturers' Association. He is survived by a wife, one sister and a son, Frederick L. Sivyer, who is vice president of the Northwestern Malleable Iron Co.

Daniel Eagan, former president of the American Steel Foundries Co., died June 9, after a short illness, at his home in Philadelphia. He organized and was the first president of the American Steel Castings Co., which controlled several casting plants in eastern Philadelphia. Mr. Eagan was born in Ireland in 1845, and when an infant his parents emigrated to Canada, locating at Galt, Ont. He was early left an orphan, and, in 1864, had located in Sharon, Pa., where he engaged in the foundry business, conducting the enterprise for about 14 years.

In 1879 he leased a shop in Sharon and opened a branch of the Sharpsville works in partnership with Samuel McClure, and in 1881 the company purchased the shops of William MacGilvray & Co., and the establishment was operated as the Shenango Machine Co. In 1887 he was active in the organization of the Sharon Steel Castings Co., which was later purchased by the American Steel Foundries Co. A number of years ago he retired from active business. His widow, two sons and four daughters survive.

Robert H. Boggis, president of the Taylor & Boggis Foundry Co., Cleveland, O., died June 10, aged 75 years. He was born in Geneva, N. Y., and located in Cleveland in 1853, where he entered the employ of the George Worthington Co., hardware dealers, a position which he retained for four years, when he removed to Lockhaven, Pa., engaging in the hardware business for himself for 18 years. During this period he was married to the daughter of Harvey Taylor, an iron founder of Cleveland. In 1875 he returned to Cleveland and



FREDERICK W. SIVYER

entered the foundry business with his brother-in-law, Herbert F. Taylor, who had succeeded his father. When H. F. Taylor died, in 1883, the firm was changed to the Taylor & Boggis Foundry Co. Mr. Boggis was a member of the Cleveland Chamber of Commerce, and was much interested in civic affairs. He leaves two sons, H. J. and Taylor H. Boggis, the former secretary of the Taylor & Boggis Foundry Co., and one daughter, the wife of B. F. Wade, treasurer of the company.

The entire equipment for the foundry of the Southwestern Iron & Steel Co., Oklahoma City, Oklahoma, was furnished by the Hill & Griffith Co., Cincinnati. This included a 72-inch Newten cupola.

THE FOUNDERS' EXHIBITION.

The competitive exhibition devoted to the foundry craft, arranged by the Worshipful Company of Founders, was held June 7 in the hall of the Ironmongers Co., London, England, and was interesting on account of the quality rather than the number and variety of articles entered. The first prize, of $100, for the best model of a 12-inch medal, was awarded to Stanley E. Young, who was closely pressed by Miss A. K. Halliday, who won the second prize.

In Section A, Class 1, for workers, the prize of $75 for the best casting, went to A. Huskinson, who entered a bronze goat modeled from life. All the three prizes went to artist craftsmen for animals cast in bronze. Examples of iron castings entered were a cup and saucer, with a spoon in the cup, cast in one piece, and a plate with a knife and fork laid on it. These were considered clever specimens of cored work, but neither artistic nor useful.

In Class 2, for apprentices and improvers, the prize fell to E. R. Atkinson, for a cast dog's head. Section C was devoted to workers in relief, and H. E. Warren took premier honors with a pattern for an ornamental grate back, the second prize going to F. W. Braddock, with a panel representing a monk seated at a desk and copying from a book fixed upon an easel. In Section F, for designs or patterns, were three entries from apprentices, and the first prize was awarded to G. Taylor for the model of a marine type vertical engine.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

At the June meeting of the Pittsburg Foundrymen's Association, officers for the ensuing year were elected as follows:

President, J. S. Seaman, Seaman-Sleeth Co.; vice president, W. A. Bole, Trafford City Foundries; treasurer, John McLaren, Phillips-McLaren Co., re-elected; secretary, F. H. Zimmers, Union Foundry & Machine Co., re-elected. Executive committee: Joseph T. Speer, Pittsburg Valve, Foundry & Construction Co.; O. W. Mason, Midland Steel Co., re-elected; Henry Spilker, Sterritt-Thomas Foundry Co.; William H. McFadden, Mackintosh-Hemphill Co., re-elected; J. S. McCormick, J. S. McCormick Co.

The present membership of this organization has increased to 130, and there is a comfortable balance in the treasury.

MODERN EQUIPMENT FOR THE FOUNDRY

Combined jarring and squeezing roll-over molding machine --- Pipe molding machine --- Automatic molding machine --- Direct-draw, roll-over molding machine --- Core sand washing machine

A NEW type of molding machine designed especially for deep work, on which it has hitherto been necessary to do more or less tucking by hand before squeezing the mold preparatory to drawing the pattern, is shown in the accompanying illustrations. The machine consists of a cylinder base in which a rocker shaft is mounted to carry the swinging head against which the mold is squeezed. On the squeezing plunger, a head is mounted, which carries a roll-over pattern plate or table. This table is mounted on a rocker shaft, and on either side air cylinders are attached for the purpose of rolling over the table.

In the position as shown in Figs. 3, 4 and 6, the pattern plate rests solidly upon the plunger beneath, and in another position, as shown in Figs. 1 and 5, the roll-over table rests upon stops which hold it at right angles to the line of pattern draft. Attached to the cylinder in front is a spring counterbalanced receiving table designed to carry the weight of the flask.

The machine is operated by a hand lever on the right hand side, not clearly shown in these illustrations, and above and below under the hand lever are two finger latches, one of which starts the vibrator, and the other admits air to the roll-over cylinder. Air is admitted to the squeezing cylinder by pressing down on this hand lever, and when this is released suddenly, provision is made to open a wide exhaust, so that the plunger may drop solidly upon the cylinder base and ram the deep pockets in this way.

Fig. 6 shows the machine in readiness to receive a flask. Fig. 3 shows the mold in position after being jarred and squeezed with the bottom board clamped on. Fig. 2 shows the mold midway in the act of being rolled over. Fig. 1 shows the mold rolled over and resting upon its support. In this position the clamps are released, the vibrator is started, and the pattern is drawn by the same movement which serves, in another position of the pattern plate, to squeeze the mold. Fig. 4 shows the pattern plate rolled over ready to receive another flask, and the mold just made resting upon its support.

The supporting table is adjustable in height for different depths of molds, and the spring counterbalance is also adjustable to the weight of the mold, so that when the clamps are released no movement will take place while the pattern is drawn. This adjustment of the weight of the mold takes care of any inequalities in the depths of different flasks and the triangular frame mounted upon the support serves as a leveling cradle and takes care of the irregularities in the bottom boards used.

All of the power movements are under the control of one hand, the other hand being free to swing the yoke backward and forward, and all of the movements are performed with great rapidity. Machines of this type are now being built for installation on the upper floors of buildings, the cylinder base being mounted upon the anvil of a shockless jarring machine. This molding machine is built by the Tabor Mfg. Co., Philadelphia.

FRENCH MOLDING MACHINES.

The agreement with the American agents for the line of molding machines manufactured by Ph. Bonvillain & E. Ronceray, Paris, France, for the sale of these labor-saving devices in this country has been termi-

FIG. 1—MOLD ROLLED OVER, BEFORE PATTERN IS DRAWN

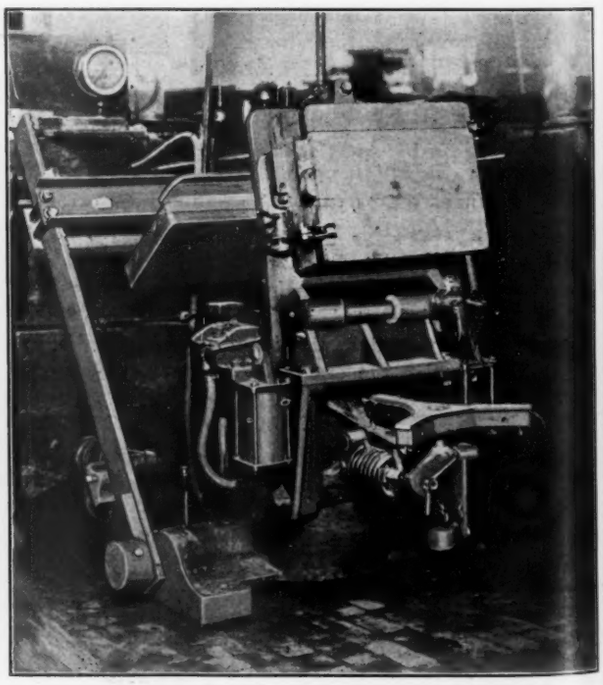


FIG. 2—THE MOLD WHILE IT IS BEING ROLLED OVER

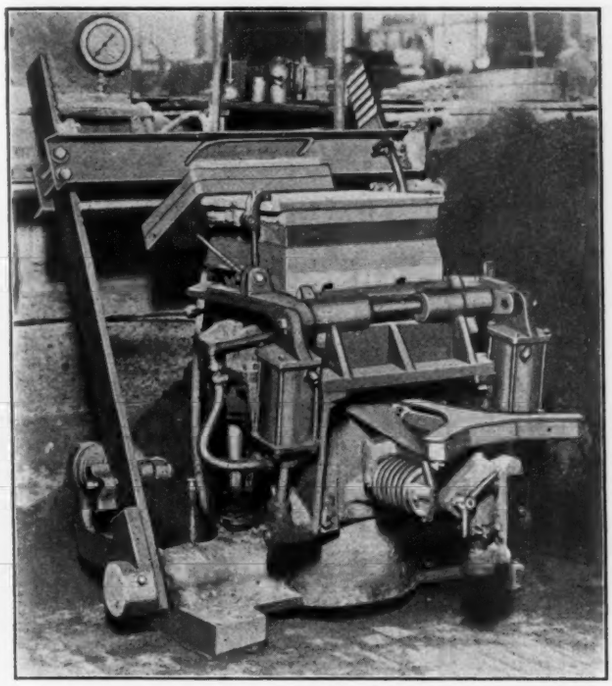


FIG. 3—MOLD AFTER BEING JARRED AND SQUEEZED, WITH BOTTOM BOARD CLAMPED ON

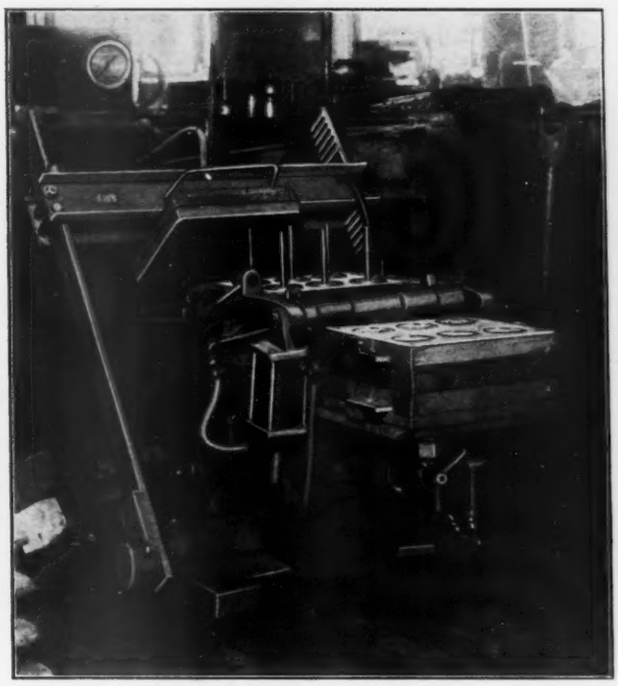


FIG. 4—MOLD ON ITS SUPPORT, THE PATTERN PLATE BEING ROLLED OVER, TO RECEIVE ANOTHER FLASK

nated, the American patent rights having been purchased by the original owners. The French company is now in position to furnish these machines to foundries in this country direct and to license foundrymen to use their pattern system in the United States. This line of molding machines has been greatly improved during the past 12 months and abroad the Universal system has been applied to making molds for all kinds of castings, from those weighing a few ounces to many tons.

TROPENAS STEEL CO.'S FOUNDRY SOLD.

The Tropenas Steel Co., Newcastle, Del., has sold its steel casting foundry to the Edgar Allan American Manganese Steel Co., which recently purchased the manganese steel plant of the American Brake Shoe Co., Chicago Heights, Ill. The capital of the new company is $3,000,000. J. C. Ward, one of the directors of the Edgar Allen Co., is also a director of the Edgar Allen Co., Ltd., of Sheffield, England. Other directors of the Edgar Allen American company are: Rudolph Ortman, J. B. Tarbell, Otis H. Cutler and Joseph G. Gallagher. The Tropenas Steel Co. will continue the manufacture of its line of side blow converters at the New Castle plant, although it is probable that the main office of the company will be moved to New York.

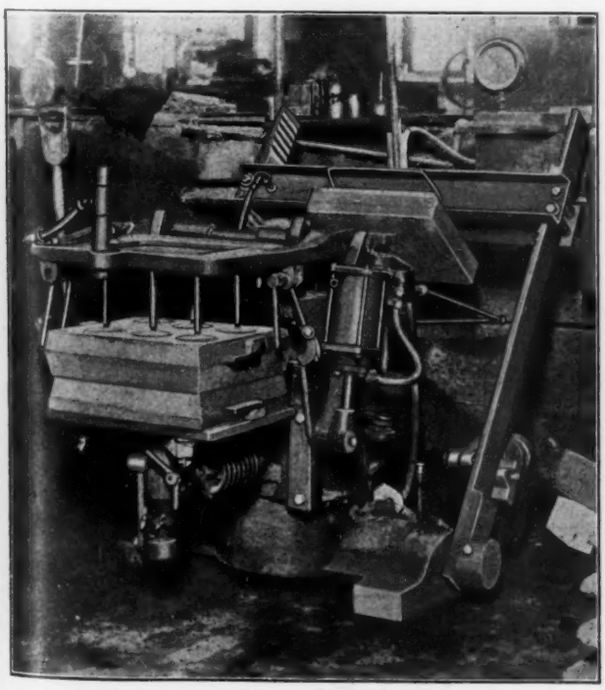


FIG. 5—LOWERING THE MOLD AWAY FROM THE PATTERN PLATE

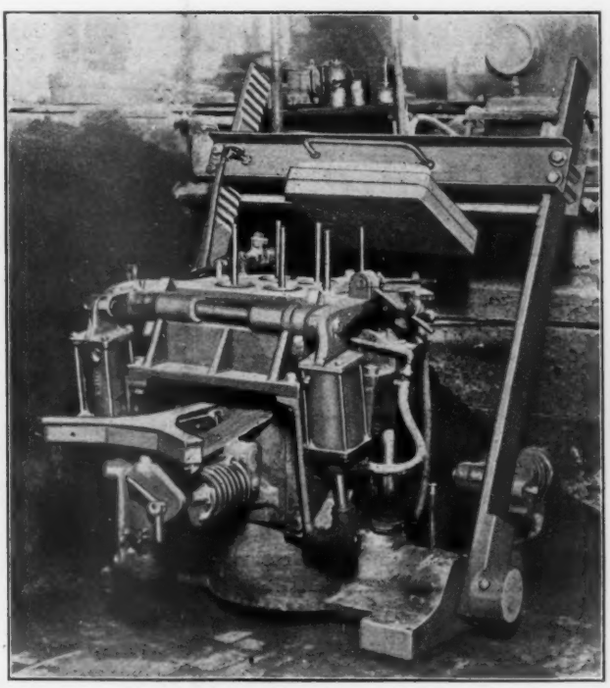


FIG. 6—MACHINE IN POSITION TO RECEIVE ANOTHER FLASK

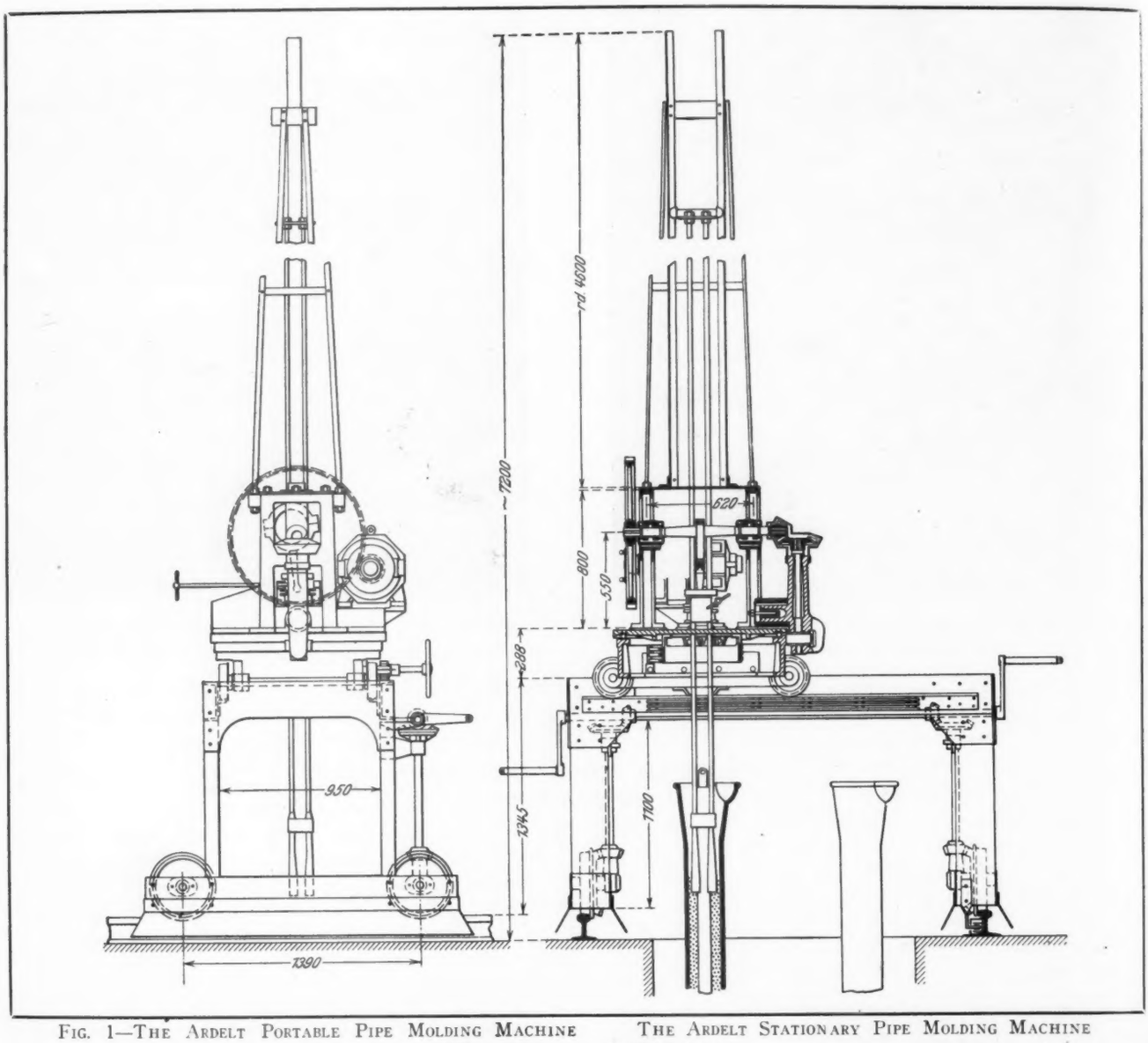


FIG. 1—THE ARDELT PORTABLE PIPE MOLDING MACHINE THE ARDELT STATIONARY PIPE MOLDING MACHINE
(Measurements are in Millimeters.)

THE ARDELT PIPE MOLDING MACHINE.

R. Ardelt & Sons, Eberswalde, Germany, are building a cast iron pipe molding machine which is meeting with much favor abroad. No special flask equipment is required, and bell and spigot, as well as flanged pipe, can be molded by this machine with equal facility. It is claimed that all of the difficulties encountered in the operation of pipe-molding machines abroad have been eliminated by the ingenious construction of this device. Some difficulties were experienced in making early installations, as the molders did not take kindly to this labor-saving device, and it is stated that they did their utmost to restrict the output. The rammers are operated at high speed, and owing to their peculiar design and construction they effect a uniform distribution of the sand, insuring a mold without hard or soft spots. The ramming head, equipped with two and eight rammers respectively, is shown in Fig. 5. The head provided with two rammers is intended for a gravity machine, while the eight-rammer head is employed when a friction coupling is used. When the flasks are set up in a row in the foundry the machine is mounted on a truck, thus becoming portable, as shown at the left, Fig. 1. The portable machine, mounted on wheels, operating on rails, is shown in Fig. 3. On the other hand, in foundries where the flasks are delivered to the machine, it is mounted on four columns, as shown at the right, Fig. 1. It is, therefore, apparent that this machine can be adapted to the methods employed in the various pipe foundries.

FIG. 2—ARDELT PIPE MOLDING MACHINE MAKING MOLDS FOR BELL-END PIPE

A wall of sand, not less than 1.6 inches thick, is recommended for all molds. The rammer is operated at a speed of 120 to 160 strokes a minute. For operating the small machine having only two rammers in the head, a 1½ horsepower motor is required, while a six horsepower motor is required to operate the large machine. The time required for making molds for cast iron pipe of various sizes is given below:

Diameter of Pipe Inches	Length Feet	Time Minutes	Seconds
1.62 to 2.40	11.8	1	15
2.80 to 3.20	13.8	1	20
3.60 to 4.00	13.8	1	25
5.00 to 6.00	15.7	1	45
7.00 to 9.00	15.7	1	55
10.00 to 12.00	15.7	2	5
14.00 to 15.00	15.7	2	15
16.00 to 20.00	15.7	2	30
22.00 to 26.00	19.7	3	
28.00 to 32.00	19.7	4	
36.00 to 40.00	19.7	5	
44.00 to 48.00	19.7	6	

For making pipe of the smaller sizes only one man is required to shovel sand, whereas six men are required when the larger sizes of pipes are being molded. The bells are also rammed by the machine, the rammer heads being spread outward, and thus work over the enlarged portion of the pattern without difficulty. The machine as operated in the cast iron pipe plant of the Lauchammer Co., in Groeditz, Saxony, Germany, is shown in Figs. 2 and 4. In this plant the flasks are mounted on a large electrically-driven turntable. The molding machine is mounted on a swinging arm which permits it to be readily centered over the pattern in the flask. As soon as the machine has been centered the ramming head is lowered, sand is shoveled into the flask, and the ramming is proceeded with until the mold is made. The machine is then swung out of the way and the pattern is drawn by a crane and the next flask is moved in position, the machine is swung over, the ramming head is lowered, and the ramming of the next mold is proceeded with. As the turntable revolves the molds are faced, dried and cast, and finally the castings are shaken out. The process is, therefore, continuous.

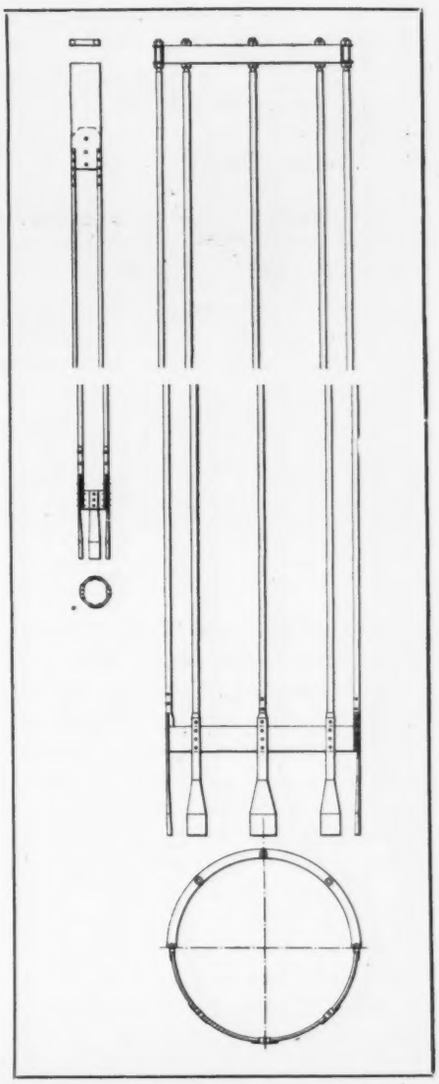


FIG. 5—ARDELT PIPE MOLD RAMMING DEVICE

FIGURING THE MELTING RATIO.

Question:—We would like to know whether the coke bed is considered when estimating the melting ratio or whether only the succeeding charges enter into this calculation.

Answer:—When estimating the melting ratio, the coke bed is considered, as well as the succeeding charges.

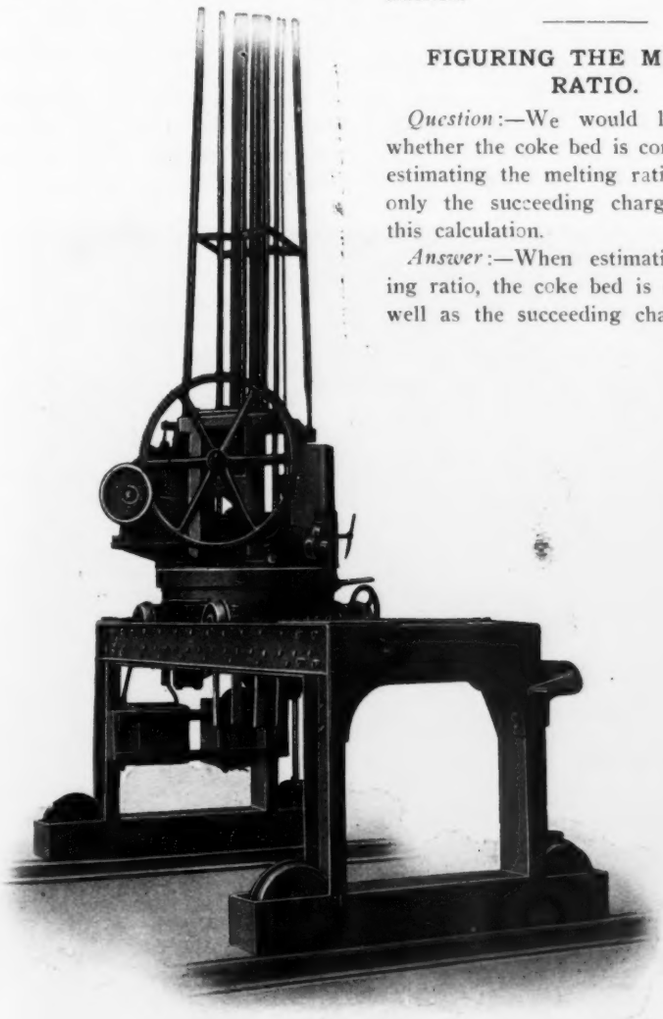
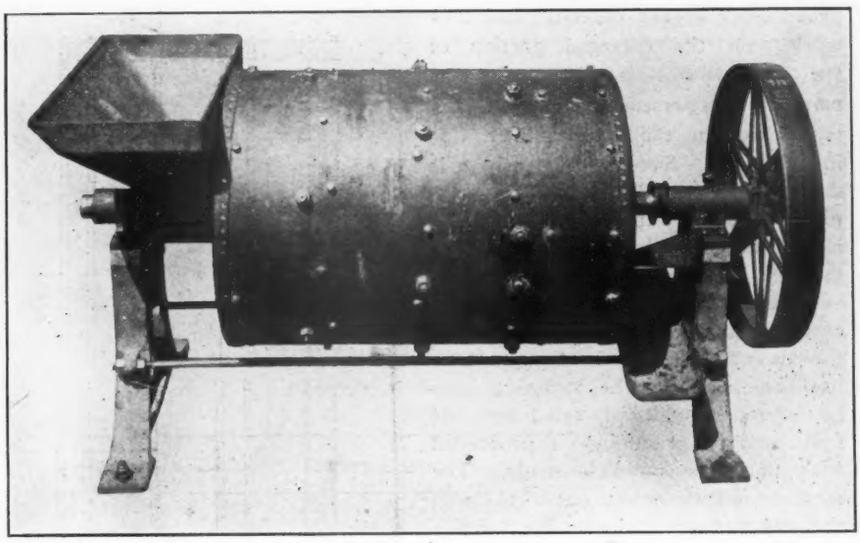


FIG. 3—ARDELT PORTABLE PIPE MOLDING MACHINE MOUNTED ON WHEELS WHICH OPERATE ON A TRACK

FIG. 4—ARDELT PIPE MOLDING MACHINE RAMMING MOLDS FOR FLANGED PIPE



OSBORN CORE SAND WASHING MACHINE

THE OSBORN CORE SAND WASHING MACHINE.

A water mill especially for washing core sand, built by the Osborn Mfg. Co., Cleveland, is shown herewith. The economies that can be effected in foundries by the reclamation of core sand by the washing process are great, and are more pronounced in districts where the cost of the core sand is high. This machine has been thoroughly tested during the past two years and has capacity for washing 16 cubic yards of black sand per day, reducing it to 12 yards of washed sand, representing a recovery of 75 per cent. This machine can be operated by one laborer, and approximately ten gallons of water are required per cubic foot of sand. In one foundry where this machine is used, the value of the sand reclaimed daily is $22.05. The cost, including the laborer's wages and the water, amounts to $2.23, making a total saving of $19.82. In addition, the washing of the sand materially improves the quality of the cores.

At the plant of the H. B. Smith Co., Westfield, Mass., where the machine was originated, cores have been made with varying proportions of washed sand and new sand, from 50 per cent to all washed sand. Using washed sand entirely, in radiator cores, out of a total of 90 molds in which these cores were set, 87 good castings were produced. In another test of cores made from all washed sand only one casting was lost out of a total of 140 molds in which these cores were set.

In the accompanying illustration the hopper which delivers the sand to the mill is shown at the left, and the washed sand is deposited in the chute at the right. All refuse and foreign matter which is lighter than the sand rises to the surface of the water and is continually carried off. A series of paddles inside of the mill, attached to the center shaft, accomplish the washing of the sand.

ARCADE AUTOMATIC MOLDING MACHINE.

The automatic molding machine built by the Arcade Mfg. Co., Freeport, Ill., described in THE FOUNDRY, February, 1909, has been further improved and perfected, and the rebuilt machine, shown in the accompanying illustrations, produces a complete mold every 35 to 40 seconds, or an average of 100 molds per hour. This automatic molding machine is especially adapted for duplicate work in large quantities, and for making molds of snap flask size.

Sand-Handling Mechanism.

In Fig. 1 is shown the sand-handling mechanism, including the sand trough, conveyor and hopper. The sand trough is built in sections and can be extended any length, to any part of the foundry floor, thus obviating the necessity of carrying the sand from the points where the castings have been shaken out, to the sand trough. This trough is provided with a reciprocating hoe conveyor, which carries the sand to the elevator boot, for delivery by a bucket conveyor to the sand hopper located above the mold-making mechanism. The buckets are attached to a belt which prevents any loose sand from falling onto the machine. The sand is delivered by the conveyor to a riddle, *A*, Fig. 1, on top of the hopper *B*. The riddle has a vertical as well as a horizontal movement, which effects a thorough screening of the sand, and all refuse

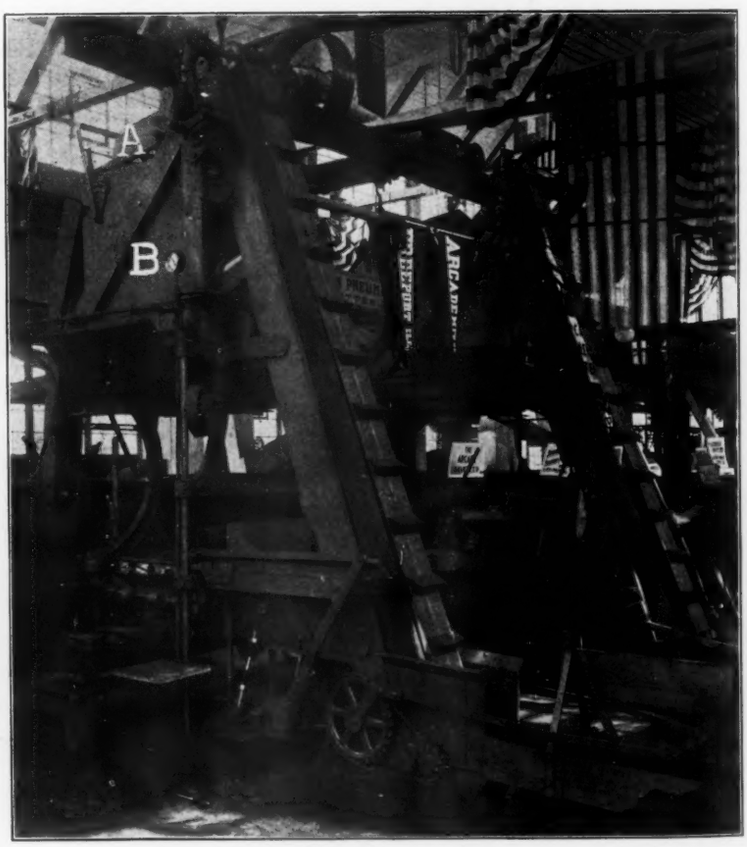


FIG. 1—ARCADE AUTOMATIC MOLDING MACHINE, SHOWING SAND CONVEYING SYSTEM

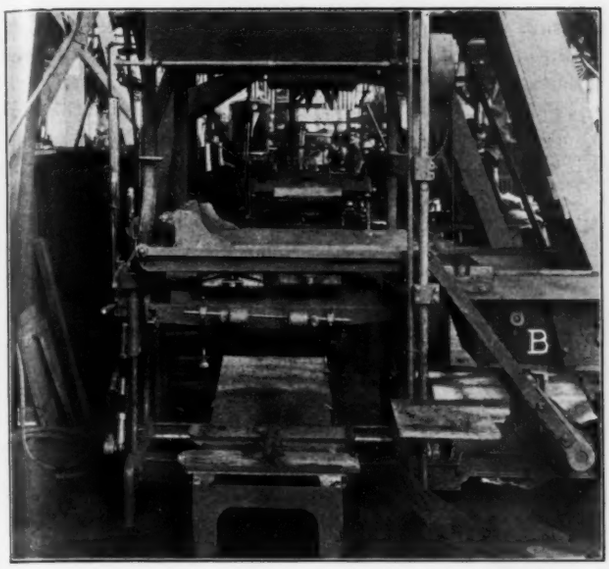


FIG. 2—STRIKE-OFF IN POSITION OVER THE FLASKS

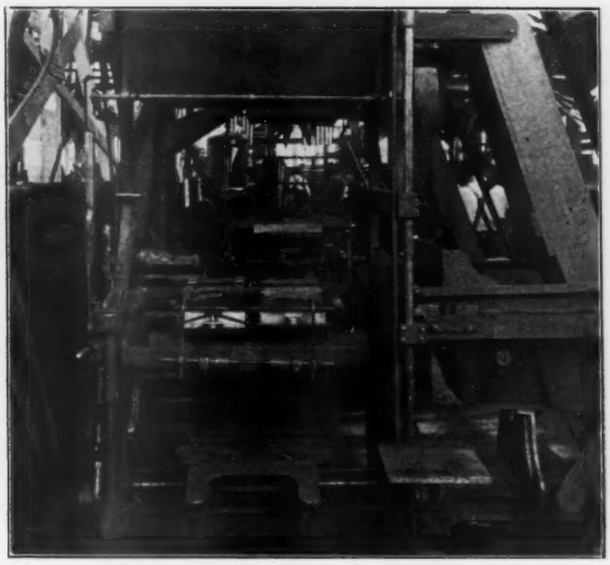


FIG. 3—SAND STRUCK-OFF AND THE FLASKS ARE CLAMPED, READY TO ROLL OVER

is thrown from the riddle into a chute attached to the side of the hopper, through which it falls to the floor. In the bottom of the hopper is a double action rocking grate, built up of removable cast iron bars, which are given a reciprocating motion when the riddle is operated. Through this grate the sand is permitted to fall onto the cope and drag pattern plates.

Strike-Off.

All of the operating levers are at the left side of the machine, as shown in Fig. 2. In this view the automatic strike-off is in position over the cope and drag snap flasks, just before the sand has been permitted to drop out of the hopper onto the pattern plate. The bottom of the sand hopper is covered by a steel door and the same lever which releases the door, permitting it to swing out, and which serves as a protection to the operator while the flasks are being filled with sand, sets the reciprocating gate in motion. The sand falls a distance of about 4 feet, and packs firmly around the pattern. After the flasks have been filled with sand, the steel door is swung back into place underneath the hopper, shutting off the sand supply and stopping the reciprocating grate. This steel door is counterbalanced, and can be swung back with little effort. The strike-off is then actuated, its movement being controlled by an air cylinder, and the surplus sand which is struck off falls into a trough, *B*, Fig. 2, leading to the elevator boot. In this trough is a single chain conveyor, provided with paddles, which carry the sand down into the elevator boot. Attached to either side of the strike-off are two arms operated by an air cylinder, which is well protected from the sand.

Making the Mold.

After removing the surplus sand from the flasks the strike-off is in the position shown in Fig. 3. Cope and bottom boards are then placed in position and clamped, and the table carrying the pattern plates and flasks is rolled over, as illustrated in Fig. 3. The molds are then rammed by drawing forward the squeezing lever at the left, and the squeezing operation automatically sets the vibrator in motion and the patterns are then drawn.

When the table carrying the pattern plates reaches its uppermost po-

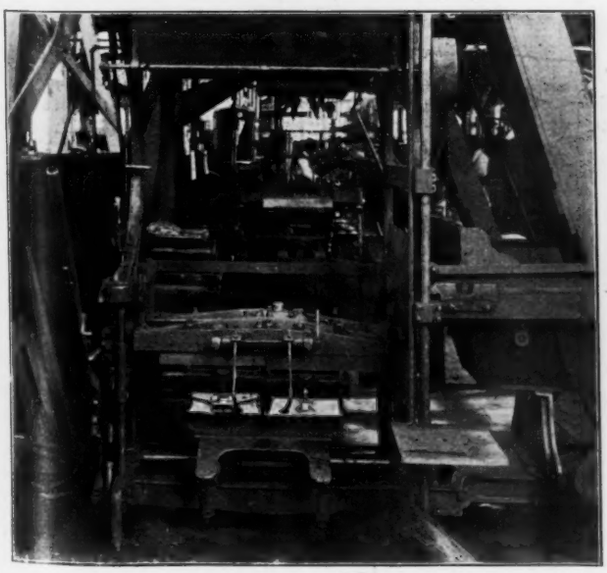


FIG. 4—MOLDS ROLLED OVER AND PATTERN DRAWN

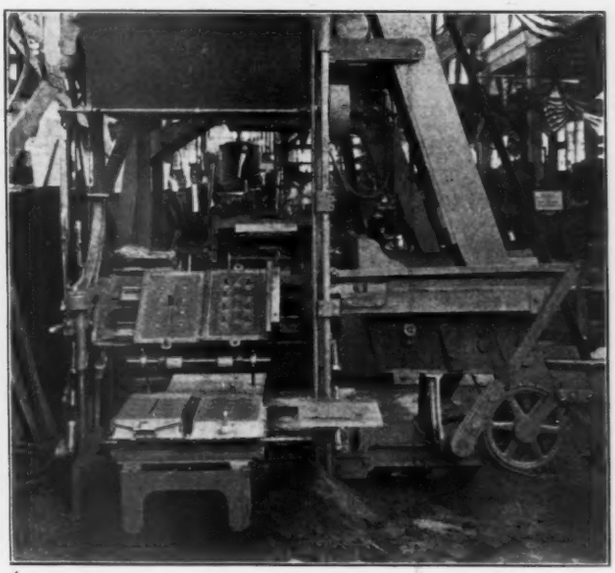


FIG. 5—COPE AND DRAG CARRIED FORWARD ON LOWER TABLE, READY TO BE CLOSED

sition, Fig. 4, air is admitted to a cylinder located inside the frame at the bottom of the machine, and the molds are automatically carried forward on the lower table, as shown in Fig. 5, ready to be closed and carried away. When this table reaches the end of its travel, air is admitted automatically to a side cylinder, which rolls over the pattern plate table and returns it to the position for receiving cope and drag flasks for making another mold. This machine can be operated by two handymen, the one making molds while the other closes them, carries off and fills the trough with sand. At the Detroit Exhibit of foundry supplies and equipment, where this machine was first displayed, 733 molds were made in seven hours.

FIG. 1—OSBORN DIRECT-DRAW, ROLL-OVER MOLDING MACHINE, SHOWING RECEIVING TABLE IN POSITION TO LOWER THE MOLD AWAY FROM THE PATTERN

THE OSBORN DIRECT-DRAW ROLL-OVER MOLDING MACHINE.

The direct-draw, roll-over molding machine, shown in the accompanying illustrations, built by the Osborn Mfg. Co., Cleveland, is especially adapted for making dry or green sand cores, as well as the drag halves of molds containing large green sand cores. This machine can be used to good advantage for molding the drags of automobile gears and crank cases, housings, etc. Iron flasks up to 20 x 26 inches can be accommodated, and the maximum draft is 7½ inches. The pattern plate is attached to the table, and after adjusting the flask the mold is rammed by hand. After the bottom board has been adjusted and clamped the mold, attached to the table, is rolled over. When dry sand cores are being made a dryer plate is clamped in position in place of the bottom board.

In Figs. 1, 2 and 3 the method of making the drag half of a signal box mold is illustrated. The mold has been rolled preparatory to lowering it away from the pattern, in Fig. 1. After rolling over the mold, as previously stated, the drawing table is swung into position underneath the flask, the clamps are removed and the mold is drawn away from the pattern, as shown in Fig. 2, by a half turn of the crank at the front of the machine. So accurate is this drawing device that molds can be readily printed-back.

Any unevenness of the bottom board is compensated by four depressible pins at the corners of the drawing table, which automatically adjust themselves, and all are locked by one lever, actuated either by the hand or the foot. The drawing table can also be easily and quickly adjusted in height for varying depths of flasks. After the mold or core is drawn, as shown in Fig. 2, the drawing table is swung out from underneath the table on which the pattern plate is mounted, as illustrated in Fig. 3, so that the mold or core can be easily lifted off and carried away. The pattern plate table is then rolled over, ready for making another mold or core.

At the foundrymen's convention in Detroit, where this machine was exhibited, the cope half of this mold was rammed on an Osborn, adjustable, flask-stripping molding machine. The making of molds in which the cheek of a pattern had expanding lugs and flanges, attracted considerable attention. The lugs and flanges would apparently prevent the drawing of the pattern, but these lugs and flanges are folded in by an ingenious device, thereby permitting the drawing of a pattern without difficulty.

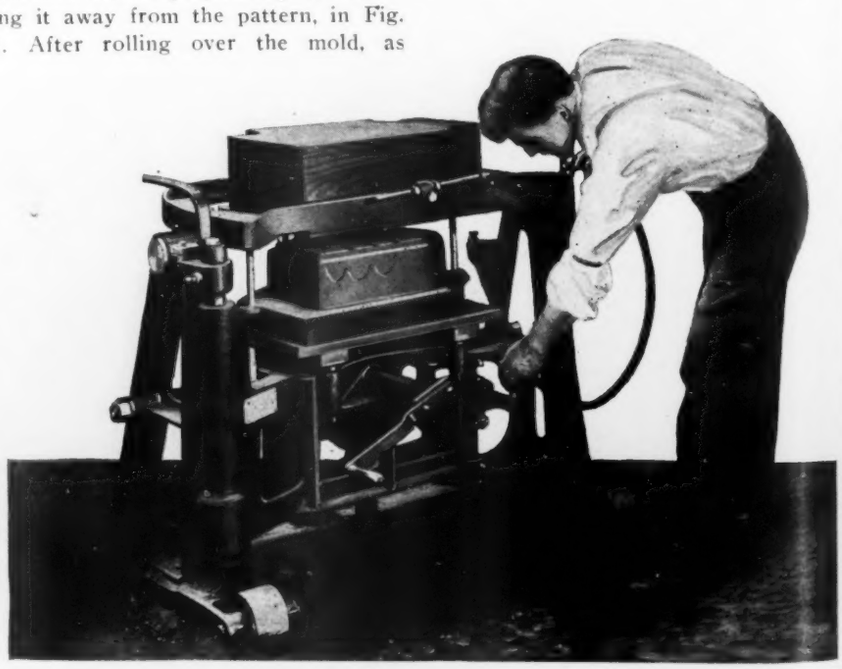


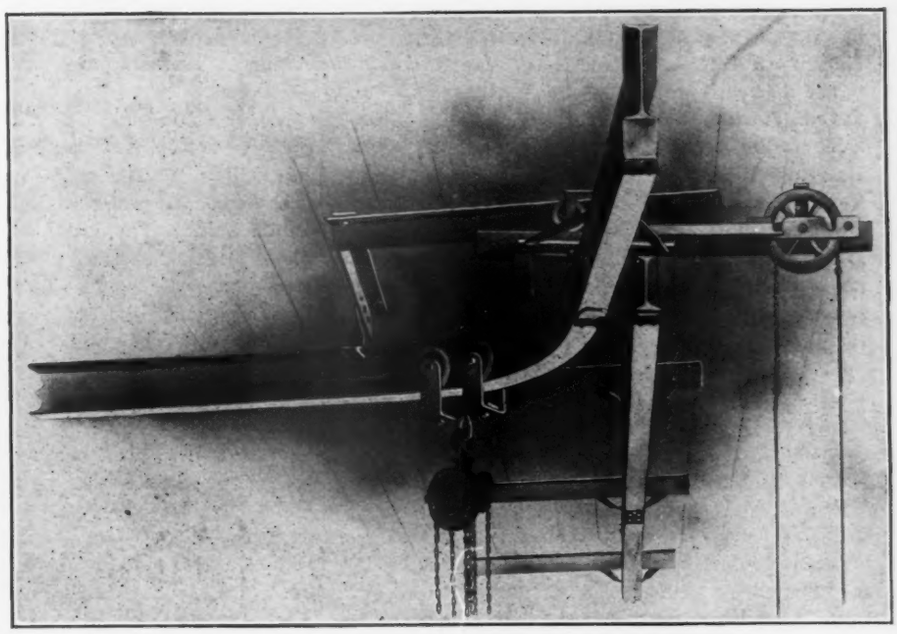
FIG. 2—MOLD LOWERED AWAY FROM THE PATTERN

RANDALL TRAMRAIL SYSTEM.

The tramrail system shown in the accompanying illustration is manufactured and installed by the Randall Tramrail Co., Philadelphia, who, after a study of the transportation problem in foundries, conceived the need of greater mobility. This tramrail consists essentially of a suspended I-beam, with a trolley running along its lower flange. From this trolley hangs a chain hoist, or a rod, which carries the ladle, bucket, cage, or any other object to be moved. The I-beams are hung securely to any roof construction and the system works equally well whether the roof is high or low, steel, wood or concrete. The hangers are strong and durable, simple and easily put in place, there being absolutely no sway with the heaviest load.

The trolleys are built with swivel joints, giving them a remarkably small curve radius, in fact a radius of 24 inches has been successfully installed and may be placed when necessary. The trolley will take this curve easily without stopping. The wheels are made of steel, turned down true from a center. The switches consist of a hinged rail, or switch tongue, which is firmly locked and cannot, by any possibility, move unless operated by a lever. The levers are simple and the action positive and quick. The ends of the switches can never be left open, therefore there is no possibility of a trolley falling.

The introduction of this system greatly extends the usefulness of the common laborer. Under the old foundry method his capacity is limited by his physical strength; 300 pounds in a wheelbarrow, or 50 pounds of hot metal in a ladle. The industrial car and the wheel-mounted ladle increased his capacity to 600 or 1,000 pounds. The overhead trolley makes it easy to propel 1,500 or 2,000 pounds with less effort than before, and in less time. A feature of this installation consists of a standard scale beam, inserted in a section of the tramrail at any desired point. As the car passes over this section, the weight is immediately recorded. This makes it possible to weigh small castings and to determine the number instead of counting them, eliminating disputes between molders and counters. This system can be made to cover any part of the foundry by means of its switches and turnouts, and proves very effective in reducing foundry costs. A booklet of 14 pages, entitled "Foundry Economy," is issued by this concern and contains many pointers of interest to foundrymen.



RANDALL TRAMRAIL, SHOWING CURVE AND SWITCH

FIG. 3—RECEIVING TABLE SWUNG OUT, WITH THE MOLD READY TO BE CARRIED AWAY

TRADE NOTES.

George B. Foster has been appointed Chicago sales manager of the Wisconsin Engine Co., with offices in the Fisher building.

J. K. Dimmick & Co., Land Title building, Philadelphia, have established an office in the Fairmont Trust building, Fairmont, W. Va., Theodore Werkman being in charge.

The E. Stebbins Mfg. Co., Springfield, Mass., recently installed 12 squeezers, manufactured by the Berkshire Mfg. Co., Cleveland. These machines were sold by W. H. Nicholls, 30 Church street, New York City.

Ellsworth Kaye has been appointed Pittsburg representative of the Federal Foundry Supply Co., Cleveland, manufacturer of foundry supplies and equipment, and a branch office of this concern has been established at 400 Grant street, Pittsburg.

The Westinghouse-Church-Kerr Co., engineers, New York City, is erecting a new brass foundry for the Chesapeake & Ohio Railroad. The equipment, including one automatic Berkshire molding machine, together with pattern plates and flasks, as well as tumbling barrels, wire straighteners, etc., was furnished

by W. H. Nicholls, 30 Church street, New York City.

The Packard Motor Car Co., Detroit, has installed in its new foundry a 36-inch cupola, built by the Northern Engineering Works, Detroit. An electric traveling crane is also being furnished the Packard Motor Car Co. by this concern. The Ford Motor Co., of Detroit, has also recently installed two 60-inch, Newton cupolas in its new foundry.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Co., Jersey City, N. J., the old board consisting of Geo. T. Smith, William Murray, William H. Corbin, Edward L. Young, Geo. E. Long, William H. Bumsted and Harry Dailey, was unanimously re-elected. The board of directors re-elected the former officers, namely, Geo. T. Smith, president; William H. Corbin, vice president; Geo. E. Long, treasurer; Harry Dailey, secretary; J. H. Schermerhorn, assistant treasurer and assistant secretary.

The Sand Mixing Machine Co., 220 Broadway, New York City, has increased its capital stock from $10,000 to $175,000, of which $75,000 is preferred and $100,000 common stock. The assets of the Auto Sand Mixer Co., Piqua, O., including patents, were purchased by the Sand Mixing Machine Co., and the Auto Sand Mixer Co. has retired from business. The Sand Mixing Machine Co. is an Ohio corporation, with its home offices at Greenfield, O., but the general offices are located at 220 Broadway, New York City. Officers have been elected as follows: President, E. L. McClain; secretary, Chas. Mains; treasurer, Fay Baldwin, all of Greenfield, O.; vice president and general manager, V. E. Minich, 220 Broadway, New York City.

The Sterling Wheelbarrow Co., Milwaukee, manufacturer of rolled steel flasks, is now moving into its new plant at West Allis, Wis. The buildings are of fireproof construction throughout, the roofs being of the saw-tooth type. The new works have three times the floor space provided by the Milwaukee plant, and are equipped with the most modern, motor-driven labor-saving machinery. Greatly increased facilities are afforded for the manufacture of rolled steel foundry flasks, and prompt deliveries can be insured. The demand for these flasks has grown rapidly and negotiations are now pending with several steel works for rolling larger sections, to meet the heavy demand for flasks of greater dimensions than are now being made. In addition, this concern manufactures a complete line of wheelbarrows.

General Industrial Notes

The Murphy Iron Works, Detroit, will erect an extension to their foundry.

The Wisconsin Engine Co., Corliss, Wis., will erect a $15,000 pattern building.

The Hasty Mfg. Co., Elgin, Ill., will erect a foundry, 16 x 29 feet.

The Cadillac Motor Car Co., Detroit, will make extensive improvements this summer, and will build a new foundry.

The Alex. Kilpatrick & Sons Co., St. Louis, whose plant was recently destroyed by fire, will rebuild.

The Standard Foundry Co., Racine, Wis., is building an addition, to be used as a core room.

The Beaver Dam Foundry Co., Beaver Dam, Wis., will erect a foundry to make gray iron, brass and aluminum castings.

The Michigan Auto Castings Co., Pontiac, Mich., recently organized, will erect a foundry.

The Griffin Wheel Co., South Tacoma, Wash., will erect four buildings at a cost of $125,000, among which will be a reinforced concrete and brick foundry, 75 x 300 feet.

The Great Northern Railroad, St. Paul, Minn., has awarded the contract for a new foundry at the Dale street shops, to cost $85,000.

The Waterloo Gasoline Engine Co., Waterloo, Ia., is erecting an addition to its foundry, which will give it about 120,000 square feet of floor space. It will be ready for occupancy in about 60 days.

The J. I. Case Threshing Machine Co., Racine, Wis., will erect a foundry, 100 x 800 feet, at Lakeside, on the outskirts of Racine. It is expected the plant will have a capacity of 200 tons of finished castings daily.

French & Hecht, Davenport, Ia., have commenced the erection of a new foundry of reinforced concrete, two stories, the main floor of which will afford 50,000 square feet of working space. The second floor of the plant will be used as a molding room.

The Norton Car & Foundry Co., Norton, Va., which recently increased its capital from $15,000 to $40,000, expects to commence work shortly on the erection of a foundry. The new building will be built on the site of the present plant.

The International Harvester Co., Milwaukee, will erect a new foundry 150 x 750 feet. The building will be of steel and brick construction, with concrete floors, saw tooth roof, etc., and will be used principally for the production of castings for gasoline engines.

The National Sanitary Mfg. Co., Salem, O., has commenced work on the addition to its foundry. The new building will be 30 x 60 feet, and will increase the output of the small sanitary ware manufactured at its plant, over 30 per cent.

The Brevier Gas Engine Co., Kalamazoo, Mich., has incorporated with a capital stock of $100,000, and will erect several buildings on a six-acre tract. These will include a foundry and machine and pattern shops. The company will manufacture gas engines designed by Henry Brevier, of Grand Rapids.

The Detroit Valve & Fittings Co., Wyandotte, Mich., whose plant was recently damaged by fire to the extent of $10,000, immediately commenced to rebuild, and is erecting a two-story building, 65 x 72 feet, to be used as a core room. The foundry operations were only delayed a few days by the fire.

The Jewel Steel & Malleable Iron Co., Buffalo, has been incorporated with a capital of $50,000, and will build an extensive plant in the Black Rock manufacturing district for the production of high grade steel and malleable castings. C. Jewel and A. W. Valentine, 172 East street, are the incorporators.

The Northern Pacific Railway Co. is erecting several buildings at Brainard, Minn., consisting of a pattern shop 50 x 80 feet, a pattern storage building 50 x 80 feet, four stories, and a foundry 120 x 320 feet, with a daily capacity of 50 tons of gray iron and six tons of brass castings. The main bay will be equipped with a 10-ton traveling crane and a 25-ton jib crane, while the side floors will be commanded by a 2-ton traveling crane.

The Enterprise Foundry Co., Detroit, manufacturer of brass, bronze, aluminum and gray iron castings, is building a reinforced concrete addition to its foundry 105 x 68 feet, and a core shop 105 x 68 feet, which will be equipped with a battery of six core ovens. A carpenter shop, 30 x 70 feet, is also being added and cleaning, shipping and storage departments are being extended and will be located in a two-story building of brick and steel construction, having a total floor area of 12,000 square feet. The cupola charging floor is also being increased by the erection of an addition 28 x 40 feet, and a 3-ton electric elevator is being installed. Contracts have been placed for 125 horsepower generators and motors, chain-driven from Buckeye engines. All of the machinery in the plant will be motor-driven.

Among the Brass Foundries.

The East Moline Brass Works, Moline, Ill., has been organized by E. J. Friedesley, and construction work on the foundry, 40 x 44 feet, with an ell extension, has been begun.

The Racine Brass & Aluminum Co., Racine, Wis., has nearly completed its new foundry building and expects to have it ready for occupancy within a month.

John L. Fitzgerald, Albany, N. Y., has purchased a foundry on Pleasant street, formerly owned by Haight & Clark. The plant will be converted into a first class brass foundry, and will be placed in operation shortly.

The Imperial Brass Mfg. Co., Chicago, brass founders, will erect a building at Center avenue and Harrison street, for the manufacture of their various specialties. The estimated cost is $150,000.

The D. T. Williams Valve Co., Cincinnati, O., has decided not to erect a new plant, as originally contemplated, but will occupy the present building of the Cincinnati Bickford Drill & Tool Co., on Spring Grove avenue, when the plant being erected by the latter company at Oakley is completed in December. An additional foundry building, 60 x 138 feet, will be erected by the Williams company and fully equipped to manufacture its own brass castings.

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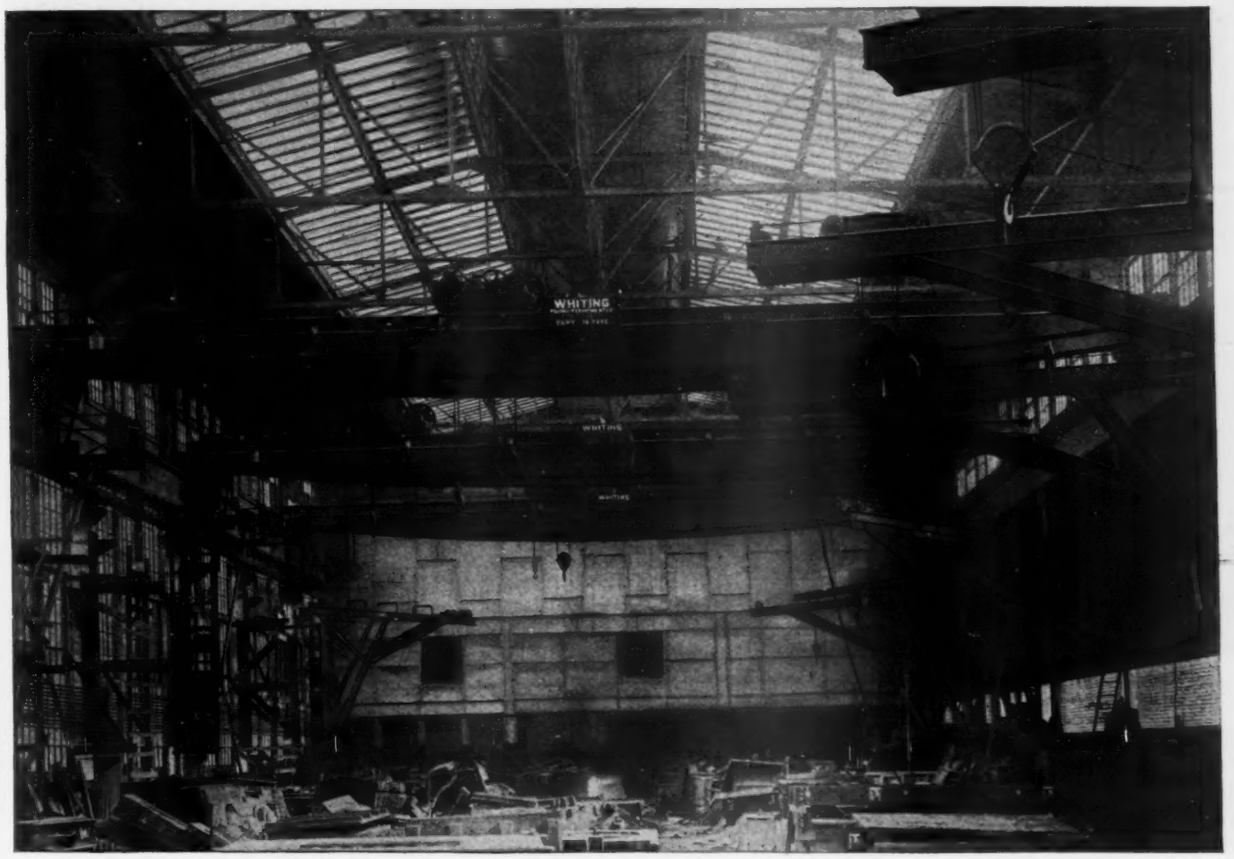

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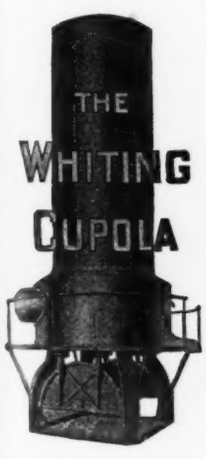

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Cleveland Wire Spring Co., Cleveland, O.

BELLOWS.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Colonial Brush & Mfg. Co., Milwaukee, Wis.
Dobson, Wm., Canastota, N. Y.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Providence, New York, Buffalo.

BLACKING MIXTURES.

Smith, J. D., Fdy. Supply Co., Cleveland, O.

BLOWERS.

American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Connersville Blower Co., Connersville, Ind.
Exeter Machine Wks., Boston, Mass.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Piqua Blower Co., Piqua, O.
Roots, P. H. & F. M., Co., Connersville, Ind.
Sirocco Engineering Co., Detroit, Mich.
Sturtevant, B. F., Co., Hyde Park, Mass.

BLOWERS.

(Positive Pressure.)

Connersville Blower Co., Connersville, Ind.
Exeter Machine Wks., Boston, Mass.
Pangborn Company, Thomas W., New York.
Piqua Blower Co., Piqua, O.
Roots, P. H. & F. M., Co., Connersville, Ind.
Sturtevant, B. F., Co., Hyde Park, Mass.

BOXES.

(Annealing)

Whiting Fdy. Equipment Co., Harvey, Ill.

BOXES.

(Factory.)

Cleveland Wire Spring Co., Cleveland, O.

BRAZING OUTFITS.

Hauck Mfg. Co., Brooklyn, N. Y.
Rockwell Furnace Co., New York.

BRONZE.

(Manganese.)

Ajax Metal Co., Philadelphia, Pa.
Cramp, Wm., & Sons, Ship & Engine Bldg. Co., Philadelphia, Pa.
Damascus Bronze Co., Pittsburg, Pa.

BRONZE.

(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

BRUSHES.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Colonial Brush & Mfg. Co., Milwaukee, Wis.
Federal Fdry. Supply Co., Cleveland, O.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Levett Mfg. Co., Matawan, N. J.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland.
Paxson Co., J. W., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.
Whitehead Bros. Co., Providence, New York, Buffalo.

BUFFS.

Levett Mfg. Co., Matawan, N. J.

BURNERS.

(Oil.)

Anthony Co., New York, N. Y.
Hauck Mfg. Co., Brooklyn, N. Y.
Pangborn Company, Thomas W., New York.
Rockwell, W. S., New York.
Rockwell Furnace Co., New York.
Whiting Fdy. Equipment Co., Harvey, Ill.
Levett Mfg. Co., Matawan, N. J.

CARS.

(Annealing, Pig Iron, Etc.)

Atlas Car & Mfg. Co., Cleveland, O.
Whiting Fdy. Equipment Co., Harvey, Ill.

CARS.

(Charging.)

Whiting Fdy. Equipment Co., Harvey, Ill.

CARS.

(Core Oven.)

Atlas Car & Mfg. Co., Cleveland, O.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Whiting Fdy. Equipment Co., Harvey, Ill.

CARS.

(Industrial.)

Whiting Fdy. Equipment Co., Harvey, Ill.
Wonham, Sanger & Bates, New York City.

CASTINGS.

(Phosphor-Bronze.)

Phosphor-Bronze Smelting Co., Ltd., Phila., Pa.

CASTINGS.

(Steel.)

Otis Steel Co., Ltd., Cleveland.

CASTINGS.

(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

CEMENT.

(Furnace.)

Gautier, J. H., & Co., Jersey City.

CEMENT.

(Iron.)

Clark Cast Steel Cement Co., Shelton, Conn.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.

CEMENT.

(Metallic.)

Clark Cast Steel Cement Co., Shelton, Conn.
Hill & Griffith Co., Cincinnati, O.
Johns-Manville, H. W., Co., New York, N. Y.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Paxson Co., J. W., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.
Shelton Metallic Filler Co., Derby, Conn.
Smooth-On Mfg. Co., Jersey City.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Providence, New York, Buffalo.

CEMENT.

(Steel)

Shanafelt Mfg. Co., Canton, O.

CHAIN BLOCKS.

Ford Chain Block Co., Philadelphia, Pa.

CHAPLETS.

Burdick & Son, Albany, N. Y.
Champion Machine & Forging Co., Cleveland, O.
Cleveland Chaplet & Mfg. Co., Cleveland, O.
Federal Foundry Supply Co., Cleveland, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Lindsay, W. W., & Co., Philadelphia.
Philadelphia Chaplet & Mfg. Co., Philadelphia.
Rochester Fdy. Co., Rochester, N. Y. (Gray iron.)
Shanafelt Mfg. Co., Canton, O.

CHAPLETS.

(Perforated.)

Hill & Griffith Co., Cincinnati, O.
Obermayer, S., Co., Cincinnati, O.

CHARCOAL.

Phipps Charcoal Co., Ironton, O.

CHEMICALS.

Wiarda, John C., & Co., Brooklyn, N. Y.

CHEMISTS.

Bayless Chemical Laboratory, Muncie, Ind.
Davis, Geo. C., Philadelphia, Pa.
Dover Laboratory, Dover, N. J.
Engineers & Founders Laboratories, Pittsburg.
Gulick-Henderson & Co., Pittsburg, Pa.
Metallurgical Laboratory, Pittsburg, Pa.
Smith, Rudy & Co., Philadelphia, Pa.

CHIPPERS.

Pittsburg Pneumatic Tool Co., Canton, O.

CINDER MILLS.

Cleveland Nickel Works, Cleveland, O.

CLAMPS.

(Flask.)

Barnett, Oscar, Fdy. Co., Newark, N. J.
Diamond Clamp & Flask Co., Richmond, Ind.
Josef, E. E., Mfg. Co., Buffalo, N. Y.

COKE.

Baird & West, Detroit, Mich.
Debevoise-Anderson Co., New York.
Hanna & Co., M. A., Cleveland, O.
Hillman, J. H., & Son, Pittsburg.
Jamison Coal & Coke Co., Pittsburg, Pa.
Matlack & Bates, Philadelphia, Pa.
Mount Carbon Co., Ltd., Powellton, W. Va.
Pilling & Crane, Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

COKE.

(Crushed.)

Mount Carbon Co., Ltd., Powellton, W. Va.

COMPOSITIONS.

Levett Mfg. Co., Matawan, N. J.

COMPRESSORS.

Ingersoll-Rand Co., New York City.
Sullivan Machinery Co., Chicago, Ill.

CONVERTERS.

(Side Blown Steel.)

Bretaud, J. V., Detroit, Mich.
Stoughton Engineering Co., New York City.
Tropenas Steel Co., Newcastle, Del.
Whiting Fdy. Equipment Co., Harvey, Ill.

COPPER.

Vernon Metal Co., New York City.

COPPER.

(Phosphorized.)

Damascus Bronze Co., Pittsburg, Pa.

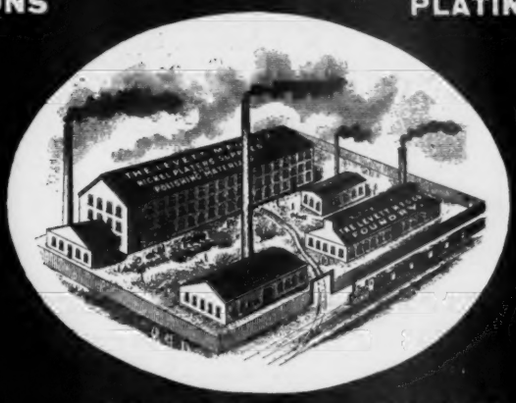
ELECTRO-PLATERS' SUPPLIES AND POLISHING MATERIALS

NICKEL ANNODES
COMPOSITIONS

NICKEL SALTS

BUFFING WHEELS
PLATING DYNAMOS

MOTORS



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WHEELS

LEATHER
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CORE BINDERS.

Federal Fdy. Supply Co., Cleveland, O.
Independence Mfg. Co., Philadelphia, Pa.
Millers' Products Co., Chicago, Ill.
Obermayer, S., Co., Cincinnati, O.
Robeson Process Co., Au Sable Forks, N. Y.

CORE COMPOUND.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Hill & Griffith Co., Cincinnati, O.
Independence Mfg. Co., Philadelphia, Pa.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Millers' Products Co., Chicago, Ill.
National Core Oil Co., Corning, N. Y.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

CORE FLOUR.

Millers' Products Co., Chicago, Ill.
Paxson Co., J. W., Philadelphia, Pa.
Piqua Flour Co., Piqua, O.

CORE MACHINES.

Brown Specialty Machinery Co., Chicago, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Falls Rivet & Mach. Co., Cuyahoga Falls, O.
Pangborn Company, Thomas W., New York.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

CORE OIL.

Independence Mfg. Co., Philadelphia, Pa.
Keystone Foundry Supply Co., Buffalo, N. Y.
National Core Oil Co., Corning, N. Y.
Paxson, J. W., Co., Philadelphia, Pa.
Peterson, T. J., Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Thompson & Co., Allegheny, Pa.
Whitehead Bros. Co.,
Providence, New York, and Buffalo.

CORE OIL COMPOUND.

Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.

CORE OVENS.

Falls Rivet & Mach. Co., Cuyahoga Falls, O.
Hill & Griffith Co., Cincinnati, O.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Millett Core Oven Co., Springfield, Mass.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Rockwell Co., W. S., New York City.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.

CORE.

(Tapering Machines.)

Brown Specialty-Machinery Co., Chicago, Ill.
Pangborn Company, Thomas W., New York.

CORE RACKS.

Terrell's Equipment Co., Grand Rapids, Mich.

CORE WASH.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Federal Fdy. Supply Co., Cleveland, O.

CORRESPONDENCE SCHOOLS.

Milwaukee Correspondence Schools, Milwaukee.
Modern Systems Correspondence School, Boston.

COUPLINGS.

(Air Hose.)

Cleveland Pneumatic Tool Co., Cleveland, O.

CRANES.

Brown Hoisting Machine Co., Cleveland, O.
Calumet Engineering Works, Harvey, Ill.
Case Crane Co., Columbus, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis & Co. Mfg. Co., St. Louis, Mo.
Maris Bros., Philadelphia, Pa.
Morgan Engineering Co., Alliance, O.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Quincy, Manchester, Sargent Co.,
Plainfield, N. J.
Ridgway, Craig & Son, Coatesville, Pa.
Sellers, Wm., & Co., Inc., Philadelphia, Pa.
Shepard Electric Crane & Hoist Co.,
Montour Falls, N. Y.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Toledo-Massillon Bridge Co., Toledo, O.
Whiting Fdy. & Equipment Co., Harvey, Ill.
Wonham, Sanger & Bates, New York City.

CRANES.

(Hand Traveling.)

Calumet Engineering Works, Harvey, Ill.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Toledo-Massillon Bridge Co., Toledo, O.
Whiting Fdy. Equipment Co., Harvey, Ill.

CRUCIBLES.

Barnett, Oscar, Fdy. Co., Newark, N. J.
Bartley Crucible Co., Jonathan, Trenton, N. J.
Buffalo Foundry Supply Co., Buffalo, N. Y.
Dixon Crucible Co., Inc., Jersey City.
Gautier, J. H., & Co., Jersey City.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Keystone Foundry Supply Co., Buffalo, N. Y.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Paige Retort & Crucible Co., Taunton, Mass.
Paxson Co., J. W., Philadelphia, Pa.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Seidel, R. B., Inc., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

CRUCIBLE FURNACES.

Hill & Griffith Co., Cincinnati, O.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Paxson Co., J. W., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.

CUPOLAS.

Barry & Zecher Co., Lancaster, Pa.
Buffalo Forge Co., Buffalo, N. Y.
Calumet Engineering Works, Harvey, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
McCormick, J. S., Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Whiting Fdy. & Equipment Co., Harvey, Ill.
Wonham, Sanger & Bates, New York City.

CUPRO-VANADIUM.

American Vanadium Co., Pittsburg, Pa.

CYLINDERS.

(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

DOWEL PINS.

Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.

DRILLS.

(Electric) (Bench, Hand, Radial)

U. S. Electrical Tool Co., Cincinnati, O.

DROSS SAVERS.

Metal Dross Economy Co., Bristol, Conn.

DUST COLLECTORS.

Knickerbocker Co., Jackson, Mich.

DYNAMOS.

(Plating.)

Levett Mfg. Co., Matawan, N. J.

ELECTRIC GENERATING SETS.

Sturtevant, B. F., Co., Hyde Park, Mass.

ELEVATORS.

Curtis & Co. Mfg. Co., St. Louis, Mo.
Northern Engineering Works, Detroit, Mich.
Ridgway, Craig, & Son, Coatesville, Pa.

ELEVATORS.

(Electric.)

Northern Engineering Works, Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.

ELEVATORS.

(Pneumatic.)

Northern Engineering Works, Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.

EMERY GRINDERS.

Osborn Mfg. Co., Cleveland, O.
Smith, J. D., Fdy. Supply Co., Cleveland, O.

ENGINES.

(Hoist, Automatic.)

Otis Elevator Co., New York City.

ENGINES.

(Steam.)

American Blower Co., Detroit, Mich.
Sturtevant, B. F., Co., Hyde Park, Mass.

ENGINEERS.

(Foundry, Mech., Elec., Etc.)

Gulick-Henderson & Co., Pittsburg, Pa.
Hawkins, David S., 1021 Rose bldg, Cleveland.
Lindsay, W. W., & Co., Philadelphia.
Northern Engineering Works, Detroit, Mich.
Pangborn Company, Thomas W., New York.
Seaver, John W., Cleveland, O.
Smith Foundry Supply Co., J. D., Cleveland, O.
Wonham, Sanger & Bates, New York City.

EQUIPMENT.

(Hoisting.)

Otis Elevator Co., New York City.

EXHAUST FANS.

Sturtevant, B. F., Co., Hyde Park, Mass.

EXHAUSTERS.

(Gas.)

Buffalo Forge Co., Buffalo, N. Y.
Exeter Machine Works Boston, Mass.

FACINGS.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Combined Foundry Supply Co., Buffalo, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Dixon Crucible Co., Jos., Jersey City.
Federal Fdy. Supply Co., Cleveland, O.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
McCormick, J. S., Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Pettinos Bros., Bethlehem, Pa.
Stevens, Frederic B., Detroit, Mich.

FANS.

American Blower Co., Detroit, Mich.
Anthony Co., New York, N. Y.
Buffalo Forge Co., Buffalo, N. Y.
Sirocco Engineering Co., Detroit, Mich.
Sturtevant, B. F., Co., Hyde Park, Mass.

FASTENERS.

(Corrugated Steel.)

Shanafelt Mfg. Co., Canton, O.

FERRO-ALLOYS.

American Vanadium Co., Pittsburg, Pa.
Blackwell, G., Sons & Co., Ltd., Liverpool, Eng.
Leavitt, C. W., & Co., New York, N. Y.
Primos Chemical Co., Primos, Pa.

FERRO-COMPOUND.

Johns-Manville, H. W., Co., New York, N. Y.

FERRO-MANGANESE.

Metal Mfg. Co., Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Stevens, Frederic B., Detroit, Mich.

FERRO-SILICON.

Metal Mfg. Co., Philadelphia, Pa.
Primos Chemical Co., Primos, Pa.
Roessler & Hasslacher Chemical Co., New York.

FERRO-VANADIUM.

American Vanadium Co., Pittsburg, Pa.
Primos Chemical Co., Primos, Pa.

FILLERS.

(Metallic.)

Clark Cast Steel Cement Co., Shelton, Conn.
Shanafelt Mfg. Co., Canton, O.
Shelton Metallic Filler Co., Derby, Conn.
Smooth-On Mfg. Co., Jersey City, N. J.

FILLETS.

(Leather and Wood.)

Kelly, T. P., & Co., New York, Chicago, Hamilton.
Obermayer, S., Co., Cincinnati, O.
Shanafelt Mfg. Co., Canton, O.

FIRE BRICK.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Combined Fdy. Supply Co., Buffalo, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Gautier, J. H., & Co., Jersey City.
Harbison-Walker Refractories Co., Pittsburg, Pa.
Maurer, Henry, & Son, New York City.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Wm. Penn Silica Works,
Wm. Penn. P. O., Philadelphia, Pa.
Valentine, M. D., & Bro., Co., Woodbridge, N. J.
Wonham, Sanger & Bates, New York City.

FIRE CLAY.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Gautier & Co., J. H., Jersey City, N. J.
Paxson Co., J. W., Philadephia, Pa.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

FIRE SAND.

Carborundum Co., Niagara Falls, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Paxson Co., J. W., Philadelphia, Pa.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

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—The Bull Dog Shovel.

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—The cheapest and best eccentric adjustable malleable clamp that you ever have seen.

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—Our own manufactured polishing wheels, including linen, canvas, paper and leather. Buffs, etc.

—Our dynamos for plating.

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The Detroit Foundry Supply Co.

Detroit, Mich.

Facing
Fire Brick
Foundry Supplies
Foundry Equipment

Windsor, Ont.

Platers' and Polishers' Supplies

FLASKS.

Adams Co., Dubuque, Iowa.
Baldwin, Tuthill & Bolton, Grand Rapids, Mich.
Barnett, Oscar, Fdy. Co., Newark, N. J.
Brass Founders' Supply Co., Newark, N. J.
Killing Molding Machine Co., Davenport, Ia.
Shanafelt Mfg. Co., Canton, O.
Smith & Caffrey Co., Syracuse, N. Y.
Sterling Wheelbarrow Co., Milwaukee, Wis.
Stevens, Frederic B., Detroit, Mich.

FLASKS.

(Iron.)

Turner Machine Co., Philadelphia, Pa.

FLASKS.

(Snap.)

Adams Co., Dubuque, Iowa.
Brass Founders' Supply Co., Newark, N. J.
Buffalo Foundry Supply Co., Buffalo, N. Y.
Diamond Clamp & Flask Co., Richmond, Ind.
Hill & Griffith Co., Cincinnati, O.
Killing Molding Machine Co., Davenport, Ia.
Jurack, Chas., Pattern & Fdy. Supply Co., Milwaukee, Wis.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.
Smith & Caffrey Co., Syracuse, N. Y.
Smith, J. D., Fdy. Supply Co., Cleveland, O.

FLOUR.

(Core.)

Federal Fdy. Supply Co., Cleveland, O.
Millers' Products Co., Chicago, Ill.
Piqua Flour Co., Piqua, O.

FLUOR-SPAR.

Stevens, Frederic B., Detroit, Mich.

FLUX.

Uraniumite Co. of America, Buffalo, N. Y.

FORGES.

(Oil.)

Hauck Mfg. Co., Brooklyn, N. Y.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Co., W. S., New York City.

FORGINGS.

Champion Machine & Forging Co., Cleveland.

FORGINGS.

(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

FOUNDRY COKE.

Mount Carbon Co., Ltd., Powellton, W. Va.

FOUNDRY EQUIPMENT.

(Iron and Brass.)

Barnett, Oscar, Foundry Co., Newark, N. J.
Detroit Fdy. Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York City.
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Pangborn Company, Thomas W., New York.
Paxson Co., J. W., Philadelphia, Pa.
Sly, W. W., Mfg. Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.
Wonham, Sanger & Bates, New York City.

FOUNDRY SUPPLIES.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Combined Foundry Supply Co., Buffalo, N. Y.
Detroit Foundry Supply Co., Detroit, Mich.
Federal Fdy. Supply Co., Cleveland, O.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Keystone Foundry Supply Co., Buffalo, N. Y.
McCormick, J. S., Co., Pittsburg, Pa.
Metal Mfg. Co., Philadelphia, Pa.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Panghorn Company, Thomas W., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.
Smith, J. D., Foundry Supply Co., Cleveland.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Providence, New York, Buffalo.

FURNACES.

Anthony Co., New York, N. Y.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Wise, J. B., Watertown, N. Y.

FURNACES.

(Annealing.)

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.

FURNACES.

(Brass.)

Kroeschell Bros. Co., Chicago, Ill.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Paxson Co., J. W., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.
Whiting Fdy. Equipment Co., Harvey, Ill.
Wise, J. B., Watertown, N. Y.
Wonham, Sanger & Bates, New York City.

FURNACES.

(Case Hardening.)

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Co., W. S., New York City.

FURNACES.

(Crucible Steel.)

Whiting Fdy. Equipment Co., Harvey, Ill.

FURNACES.

(Galvanizing.)

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Co., W. S., New York City.

FURNACES.

(Hardening.)

Rockwell Co., W. S., New York City.

FURNACES.

(Heating.)

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.

FURNACES.

(Malleable Iron.)

Whiting Fdy. Equipment Co., Harvey, Ill.

FURNACES.

(Melting.)

Barnett, Oscar, Foundry Co., Newark, N. J.
Brass Founders' Supply Co., Newark, N. J.
Foundry Equipment Co., Buffalo, N. Y.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Northern Engineering Works, Detroit, Mich.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.
Wise, J. B., Watertown, N. Y.

FURNACES.

(Oil.)

Kroeschell Bros. Co., Chicago, Ill.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.

FURNACES.

(Open Hearth Steel.)

Whiting Fdy. Equipment Co., Harvey, Ill.

FURNACES.

(Reverberatory.)

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Co., W. S., New York City.

FURNACES.

(Soft Metal Melting.)

Kroeschell Bros. Co., Chicago, Ill.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Co., W. S., New York City.
Wise, J. B., Watertown, N. Y.

FURNACES.

(Tilting.)

Kroeschell Bros. Co., Chicago, Ill.
Wise, J. B., Watertown, N. Y.

FURNACES.

(Tinning.)

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Rockwell Co., W. S., New York City.

GAS.

(Oxygen.)

American Oxygen Co., Philadelphia, Pa.

GENERATORS.

(Acetylene.)

Davis-Bournonville Co., New York, N. Y.
Goodyear, Nelson, Inc., New York, N. Y.

GRAPHITE.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Dixon Crucible Co., Jos., Jersey City, N. J.
Federal Fdry. Supply Co., Cleveland, O.
Hill & Griffith Co., Cincinnati, O.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Pettinos Bros., Bethlehem, Pa.

GRINDERS.

(Electric, Bench, Hand, Roll.)

U. S. Electrical Tool Co., Cincinnati, O.

GRINDERS.

(Pneumatic, Portable.)

Cleveland Pneumatic Tool Co., Cleveland, O.

GRINDING MACHINERY.

Adams Co., Dubuque, Iowa.
Crescent Machine Co., Leetonia, O.

GRINDING TOOLS.

Stow Mfg. Co., Binghamton, N. Y.

HAMMERS.

(Pneumatic.)

Independent Pneumatic Tool Co., Chicago, Ill.

HEATING AND VENTILATING APPARATUS.

American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Sirocco Engineering Co., Detroit, Mich.
Sturtevant, B. F., Co., Hyde Park, Mass.

HOISTS.

Brown Hoisting Mach. Co., Cleveland, O.
Case Crane Co., Columbus, O.
Detroit Hoist & Machine Co., Detroit, Mich.
Ford Chain Block Co., Philadelphia, Pa.
Northern Engineering Works, Detroit, Mich.
Ridgway & Sons Co., Coatesville, Pa.
Sellers, Wm., & Co., Inc., Philadelphia, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York.

HOISTS.

(Air.)

Calumet Engineering Works, Harvey, Ill.

HOISTS.

(Chain.)

Chisholm & Moore Mfg. Co., Cleveland, O.
Ford Chain Block Co., Philadelphia, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York City.

HOISTS.

(Electric.)

Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Quincy, Manchester, Sargent Co., Plainfield, N. J.
Sprague Electric Co., New York City.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York.

HOISTS.

(Hand.)

Northern Engineering Works, Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York City.

HOISTS.

(Pneumatic.)

Curtis & Co. Mfg. Co., St. Louis, Mo.
Detroit Hoist & Machine Co., Detroit, Mich.
Independent Pneumatic Tool Co., Chicago, Ill.
Northern Engineering Works, Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.

HOISTS.

(Skip.)

Otis Elevator Co., New York City.

HOSE.

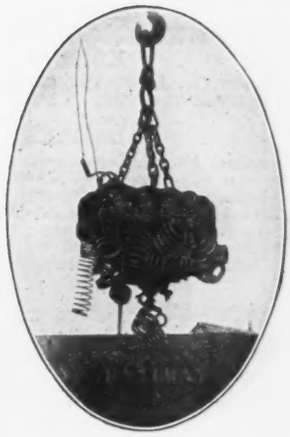
(Pneumatic.)

Cleveland Pneumatic Tool Co., Cleveland, O.

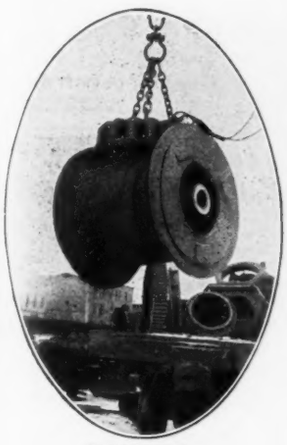
INDUSTRIAL RY. EQUIPMENT.

Atlas Car & Mfg. Co., Cleveland, O.
Johns-Manville, H. W., Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.

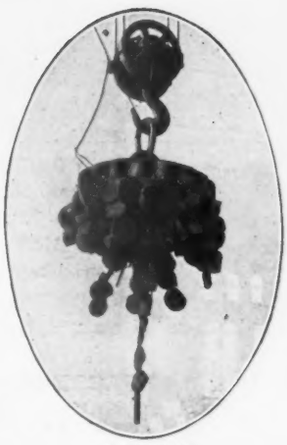
Heavy Casting



Unloading Car Springs



3500 Pound Winding Drum



Axle Butts

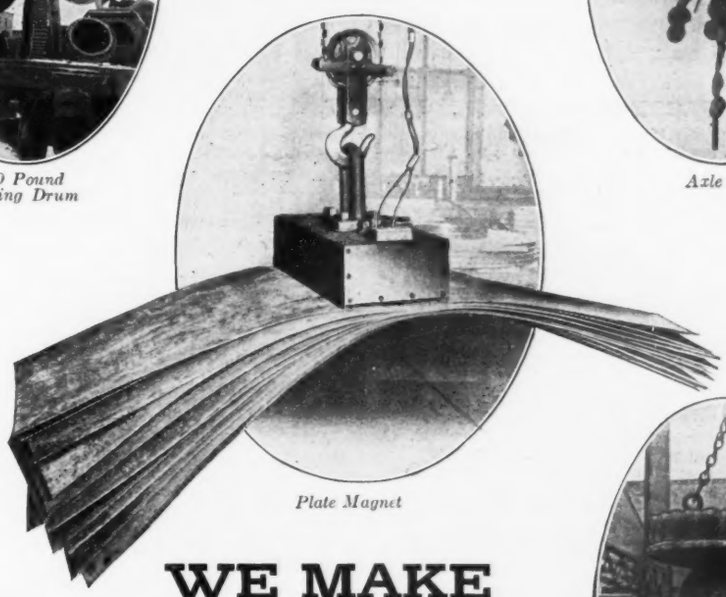
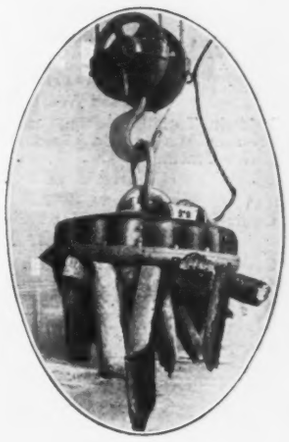
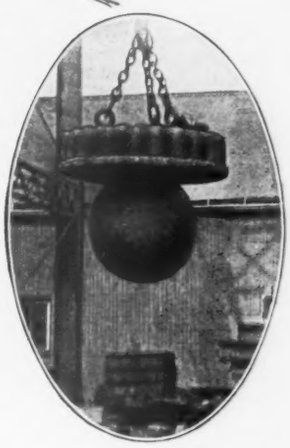


Plate Magnet



Pig Iron



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Hand Magnet

WE MAKE LIFTING MAGNETS FOR ALL PURPOSES

For handling pig iron and scrap expeditiously and at a big saving over the cost of manual labor.

For filling charging buckets and for skull cracker work.

For handling plates, tubes, rails and similar material.

In short for every imaginable class of service, from magnets capable of picking up a ten or twenty ton casting down to little hand magnets designed for reclaiming nails from the sweepings of the packing room.

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CHICAGO: Monadnock Block. BOSTON: 176 Federal St. PHILADELPHIA: 1207 Commonwealth Bldg.
PACIFIC COAST AGENTS: Otis & Squires, 155 New Montgomery Street, San Francisco.

IRON ORE.

Rogers, Brown & Co., Cincinnati, O.

KAOLIN.

Paxson Co., J. W., Philadelphia, Pa.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

LADLES.

Calumet Engineering Works, Harvey, Ill.
Detroit Fdy. Supply Co., Detroit, Mich.
Northern Engineering Works, Detroit, Mich.
Paxson Co., J. W., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.
Wonham, Sanger & Bates, New York City.

LADLE DRYERS.

Pangborn Company, Thomas W., New York.

LADLE HEATERS.

Monarch Engrg. & Mfg. Co., Baltimore, Md.
Pangborn Company, Thomas W., New York.
Rockwell Furnace Co., New York.
Rockwell Co., W. S., New York City.

LEAD.

Federal Fdy. Supply Co., Cleveland, O.

LEAD.

(Black.)

Federal Fdy. Supply Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.

LINING MATERIAL.

Philadelphia Quartz Co., Philadelphia, Pa.

LOCKERS.

(Metal.)

Terrell's Equipment Co., Grand Rapids, Mich.

MACHINERY.

(Wood Working.)

Baldwin, Tuthill & Bolton, Grand Rapids, Mich.
Crescent Machine Co., Leetonia, O.
Oliver Machinery Co., Grand Rapids, Mich.

MAGNETS.

(Lifting.)

Cutler-Hammer Clutch Co., Milwaukee, Wis.

MATCH-PLATES.

Goodale Co., Kalamazoo, Mich.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Sirocco Engineering Co., Detroit, Mich.
Sturtevant, B. F., Co., Tyde Park, Mass.

METAL.

(Magnesium.)

Leavitt, C. W., & Co., New York, N. Y.

METALS.

Birkenstein & Sons, S., Chicago, Ill.
Damascus Bronze Co., Pittsburg, Pa.
Vernon Metal Co., New York City.

METALLURGISTS.

Cox, W. W., Kansas City, Mo.
Gulick-Henderson & Co., Pittsburg, Pa.
Stoughton Engineering Co., New York City.

MOLD DRYERS.

Hauck Mfg. Co., Brooklyn, N. Y.
Monarch Engrg. & Mfg. Co., Baltimore, Md.
Pangborn Company, Thomas W., New York.

MOLDING MACHINES.

Adams Co., Dubuque, Iowa.
Arcade Mfg. Co., Freeport, Ill.
Ardelt & Sohne, Eberswalde, Germany.
Bayer Pattern Plate & Mfg. Co., Cleveland, O.
Berkshire Mfg. Co., Cleveland, O.
Buch's Sons, Elizabethtown, Pa.
Combined Foundry Supply Co., Buffalo, N. Y.
Herman Pneumatic Mach. Co., Zelienople, Pa.
Killing Molding Machine Co., Davenport, Ia.
Midland Machine Co., Detroit, Mich.
Mumford Molding Machine Co., New York City.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Pridmore, Henry E., Chicago, Ill.
Rowlands Machine Co., Racine Junction, Wis.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

MOTORS.

(Electric.)

Levett Mfg. Co., Matawan, N. J.

NAILS.

(Foundry.)

Rochester Foundry Co., Rochester, N. Y.

OIL.

(Burnease.)

New Era Lustre Co., New Haven, Conn.

PACKING.

(Rubber Sheet.)

Smooth-On Mfg. Co., Jersey City.

PAINT.

(Foundry and Machine Shop.)

Thompson & Co., Allegheny, Pa.

PARTING COMPOUNDS.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Federal Fdry. Supply Co., Cleveland, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
McCormick, J. S., Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

PATTERN LETTERS.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Knight, H. W., & Son, Seneca Falls, N. Y.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Shanafelt Mfg. Co., Canton, O.

PATTERN LUMBER.

Brown Bros. Mfg. Co., Chicago, Ill.
Thompson, Lewis, & Co., Philadelphia, Pa.

PATTERN MAKERS' SUPPLIES.

Diamond Clamp & Flask Co., Richmond, Ind.

PATTERNS.

(Metal and Wood.)

Herman Pneumatic Mach. Co., Zelienople, Pa.

PATTERN SHOP EQUIPMENT.

Oliver Machinery Co., Grand Rapids, Mich.
Standard Pattern Works Co., Cleveland, O.

PHOSPHORIZERS.

Dixon Crucible Co., Jos., Jersey City.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
New Era Mfg. Co., Kalamazoo.

PIG IRON.

Addy, Mathew, & Co., Cincinnati, O.
Breen, Wm. J., Co., Boston, Mass.
Goodrich, F. A., & Co., Detroit, Mich.
Hanna & Co., M. A., Cleveland, O.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., Philadelphia, Pa.
Nash, Isham, & Co., New York.
Perry Iron Co., Erie, Pa.
Pickands, Mather & Co., Cleveland, O.
Pilling & Crane, Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Superior Charcoal Iron Co.,
Grand Rapids, Mich.
Thomas Furnace Co., Milwaukee, Wis.
Walter-Wallingford & Co.,
Cincinnati and Pittsburg.

PIPE COVERING.

Johns-Manville, H. W., Co., New York, N. Y.

PLUMBAGO.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Dixon Crucible Co., Jos., Jersey City.
Federal Fdry. Supply Co., Cleveland, O.
Gautier, J. H., & Co., Jersey City.
Hill & Griffith Co., Cincinnati, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
McCormick Co., J. S., Pittsburg, Pa.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.
Pettinos Bros., Bethlehem, Pa.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Smith, J. D., Foundry Supply Co., Cleveland.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

PNEUMATIC TOOLS.

Independent Pneumatic Tool Co., Chicago, Ill.
Pittsburg Pneumatic Tool Co., Pittsburg, Pa.

POLISHING MACHINES.

Osborn Mfg. Co., Cleveland, O.

POLISHERS' AND PLATERS' SUPPLIES.

Detroit Foundry Supply Co., Detroit, Mich.
Levett Mfg. Co., Matawan, N. J.
Stevens, Frederic B., Detroit, Mich.

POLISHING OUTFITS.

(Stoves.)

Coates Clipper Mfg. Co., Worcester, Mass.

RAMMERS.

(Bench.)

Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.

RAPPING PLATES.

Paxson Co., J. W., Philadelphia, Pa.

RIDDLES.

Adams Co., Dubuque, Iowa.
Federal Fdry. Supply Co., Cleveland, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

RUNWAYS.

(Crane.)

Whiting Fdy. Equipment Co., Harvey, Ill.

SAND.

Brass Founders' Supply Co., Newark, N. J.
Buffalo Foundry Supply Co., Buffalo, N. Y.
Detroit Core Sand Co., Detroit, Mich.
Federal Fdy. Supply Co., Cleveland, O.
Interstate Sand Co., Zanesville, O.
McCormick, J. S., Co., Pittsburg, Pa.
Newport Sand Bank Co., Newport, Ky.
Obermayer, S., Co., Cincinnati, O.
Ohio Sand Co., Conneaut, O.
Pangborn Company, Thomas W., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Pettinos Bros., Bethlehem, Pa.
Standard Sand & Mch. Co., Cleveland, O.
Tuscora Sand Co., Cleveland, O.
Whitehead Bros. Co.,
Providence, New York, Buffalo.

SAND.

(Silica.)

International Pulp Co., New York City.

SAND BLASTS.

American Diamond Blast Co., New York City.
Farnham Sand Blast Co., New York, N. Y.
High Pressure Sand Blast Co., New York City.

SAND BLAST MACHINERY.

American Diamond Blast Co., New York City.
Betton, J. M., New York, N. Y.
High Pressure Sand Blast Co., New York City.
Niagara Device Co., Buffalo, N. Y.
Obermayer, S., Co., Cincinnati, O.
Pangborn Company, Thomas W., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Tilghman-Brooksbank Sand Blast Co.,
Philadelphia, Pa.

SAND BLAST SYSTEMS.

American Diamond Blast Co., New York City.
High Pressure Sand Blast Co., New York City.
Pangborn Company, Thomas W., New York.
Paxson Co., J. W., Philadelphia, Pa.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Tilghman-Brooksbank Sand Blast Co.,
Philadelphia, Pa.

SAND BLAST TUMBLING BARRELS.

Pangborn Company, Thomas W., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Tilghman-Brooksbank Sand Blast Co.,
Philadelphia, Pa.

SAND MIXING MACHINERY.

Falls Rivet & Machine Co., Cuyahoga Falls, O.
Mumford Molding Machine Co., New York.
Obermayer, S., Co., Cincinnati, O.
Pangborn Company, Thomas W., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Sand Mixing Machine Co., New York City.
Sellers, Wm., & Co., Inc., Philadelphia, Pa.
Standard Sand & Mch. Co., Cleveland, O.

SAND SIFTERS.

Deane Steam Pump Co., Holyoke, Mass.
Hanna Engineering Works, Chicago, Ill.
Herman Pneumatic Mach. Co., Zelienople, Pa.
Hill & Griffith Co., Cincinnati, O.
Killing Molding Machine Co., Davenport, Ia.
McCormick, J. S., Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Pangborn Company, Thomas W., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

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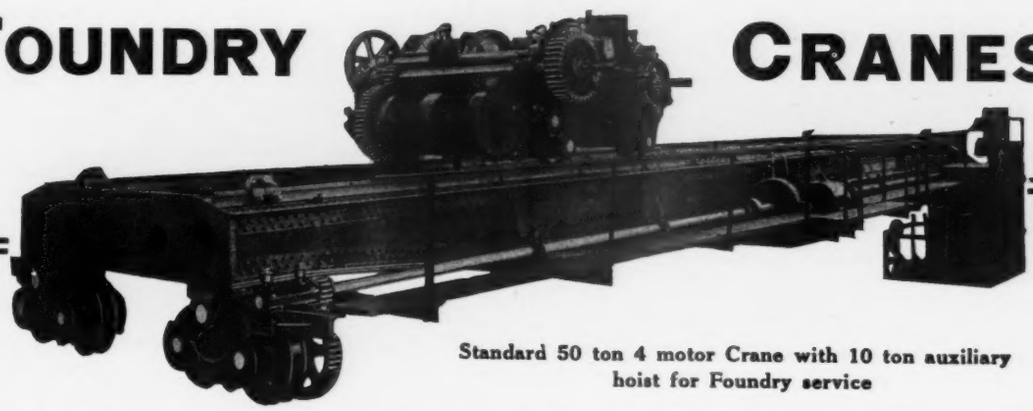
FOUNDRY CRANES



3300 Cranes in use

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Standard 50 ton 4 motor Crane with 10 ton auxiliary hoist for Foundry service

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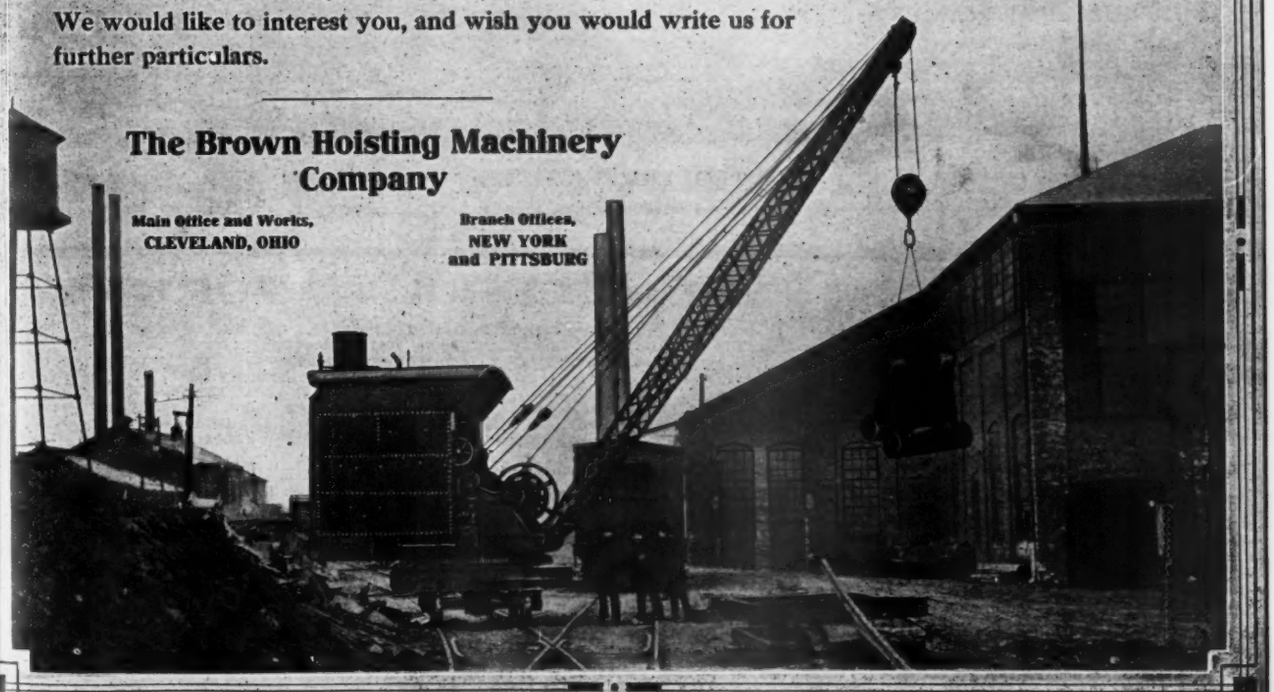
Foundries who are using our LOCOMOTIVE CRANES say they cannot dispense with them, and that they are the most useful equipments around their plants. We would like to interest you, and wish you would write us for further particulars.



The Brown Hoisting Machinery Company

Main Office and Works, CLEVELAND, OHIO

Branch Offices, NEW YORK and PITTSBURG

SAWS.
(Cold Cutting.)

Quincy, Manchester, Sargent Co., Plainfield, N. J.
Tabor Mfg. Co., Philadelphia, Pa.

SCREENS.
(Sand.)

Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.

SEACOAL.

Buffalo Foundry Supply Co., Buffalo, N. Y.
Federal Fdy. Supply Co., Cleveland, O.
Hill & Griffith Co., Cincinnati, O.
Keystone Foundry Supply Co., Buffalo, N. Y.
Obermayer, S., Co., Cincinnati, O.
Paxson Co., J. W., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Whitehead Bros. Co., Providence, New York, Buffalo.

SEPARATORS.
(Magnetic.)

Obermayer, S., Co., Cincinnati, O.
Pangborn Company, Thomas W., New York.
Paxson Co., J. W., Philadelphia, Pa.

SHAFTING.
(Flexible.)

Stow Mfg. Co., Binghamton, N. Y.

SHOVELS.

Federal Fdy. Supply Co., Cleveland, O.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
McCormick, J. S., Co., Pittsburg, Pa.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.
Whitehead Bros. Co., Providence, New York, Buffalo.

SKIMMING DEVICES.

Metal Dross Economy Co., Bristol, Conn.

SODA.
(Silicate.)

Philadelphia Quartz Co., Philadelphia, Pa.

SPELTER.

Vernon Metal Co., New York City.

SPRINGS.
(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

SPRUE CUTTERS.

Barnett, Oscar, Foundry Co., Newark, N. J.
Brass Founders' Supply Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Turner Machine Co., Philadelphia, Pa.

STARS.
(Hard Iron.)

Cleveland Nickel Wks., Cleveland, O.

STEEL.
(Vanadium.)

American Vanadium Co., Pittsburg, Pa.

STOPPERS.

Bartley, Jonathan, Crucible Co., Trenton, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Ross-Tacony Crucible Co., Philadelphia, Pa.

SWABS.
(Molders'.)

Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.

TALC.

Cohutta Talc Co., Dalton, Ga.
International Pulp Co., New York City.

TAPERS.

Paxson Co., J. W., Philadelphia, Pa.

TESTING MACHINES.

Keep, W. J., Detroit, Mich.

TONGS.
(Crucible.)

Paxson Co., J. W., Philadelphia, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.

TOOLS.
(Molders'.)

Dobson, William, Canastota, N. Y.
Federal Fdy. Supply Co., Cleveland, O.
Obermayer, S., Co., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Paxson Co., J. W., Philadelphia, Pa.
Peninsular Tool & Specialty Co., Detroit.

TOOLS.
(Pneumatic.)

Independent Pneumatic Tool Co., Chicago, Ill.
Niagara Device Co., Buffalo, N. Y.

TORCHES.

Davis-Bournonville Co., New York.
Paxson Co., J. W., Philadelphia, Pa.

TRACK.
(Industrial.)

Whiting Fdy. Equipment Co., Harvey, Ill.

TRAMRAIL SYSTEMS.

Northern Engineering Works, Detroit, Mich.
Paxson, J. W., Co., Philadelphia, Pa.
Randall Tramrail Co., Philadelphia, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York City.

TROLLEYS.

Northern Engineering Works, Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.
Yale & Towne Mfg. Co., New York City.

TROLLEY SYSTEMS.

Smith, J. D., Fdy. Supply Co., Cleveland, O.

TRUCKS.

Northern Engineering Works, Detroit, Mich.

TUMBLING BARRELS.

Northern Engineering Works, Detroit, Mich.
Paxson Co., J. W., Philadelphia, Pa.
Smith, J. D., Fdy. Supply Co., Cleveland, O.
Whiting Fdy Equipment Co., Harvey, Ill.

TUMBLING MILLS.

Adams Co., Dubuque, Iowa.
Calumet Engineering Works, Harvey, Ill.
Cleveland Nickel Works, Cleveland, O.
Falls Rivet & Mach. Co., Cuyahoga Falls, O.
Sly, W. W., Mfg. Cleveland, O.

TUNGSTEN METAL.

Primos Chemical Co., Primos, Pa.

TURBINES.
(Steam.)

Kerr Turbine Co., Wellsville, N. Y.

TURNTABLES.

Northern Engineering Works, Detroit, Mich.
Whiting Fdy. Equipment Co., Harvey, Ill.

VANADIUM.

American Vanadium Co., Pittsburg, Pa.

VENTILATORS.

Royal Ventilator & Mfg. Co., Philadelphia, Pa.

VIBRATORS.
(Compressed Air.)

Osborn Mfg. Co., Cleveland, O.

WAX
(Core.)

United Compound Co., Buffalo, N. Y.

WAX WIRE.

Field & Co., Alfred, New York City.
Kelly, T. P., & Co., New York, Chicago, Hamilton.
Paxson Co., J. W., Philadelphia, Pa.

WELDING AND EQUIPMENTS.
(Oxy-Acetylene.)

American Oxygen Co., Philadelphia, Pa.
Goodyear, Nelson, Inc., New York, N. Y.
Oxy-Acetylene Appliance Co., New York.

WELDING APPARATUS.
(Oxy-Acetylene.)

Goodyear, Nelson, Inc., New York, N. Y.
Oxy-Acetylene Appliance Co., New York, N. Y.

WHITE FINISH.

Osborn Mfg. Co., Cleveland, O.

WIRE CLEANING WHEELS.

Osborn Mfg. Co., Cleveland, O.

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One No. 5 Blower, built by the P. H. & F. M. Roots Co., Connersville, Ind., capacity of blower 20 cu. ft. per revolution. Adapted to cupola 42 to 54 in. inside lining. At 100 revolutions per minute will melt six tons per hour; at 200 revolutions per minute will melt eight tons per hour; at 250 revolutions per minute will melt ten tons per hour. Price, F. O. B. Chattanooga, $400.00.

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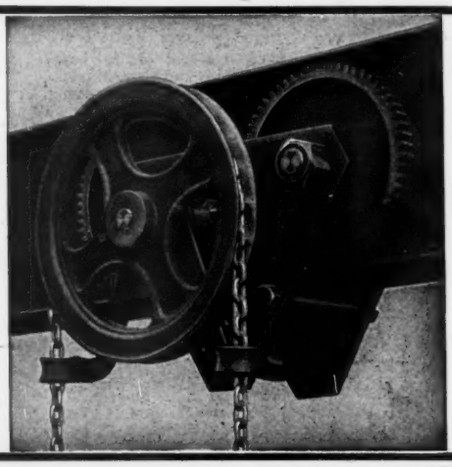

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Single I Beam Type.

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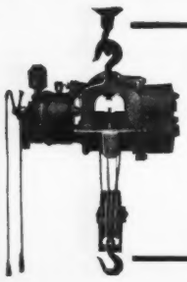

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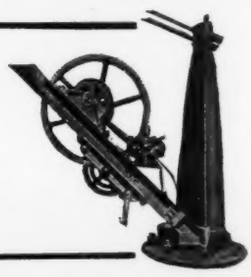

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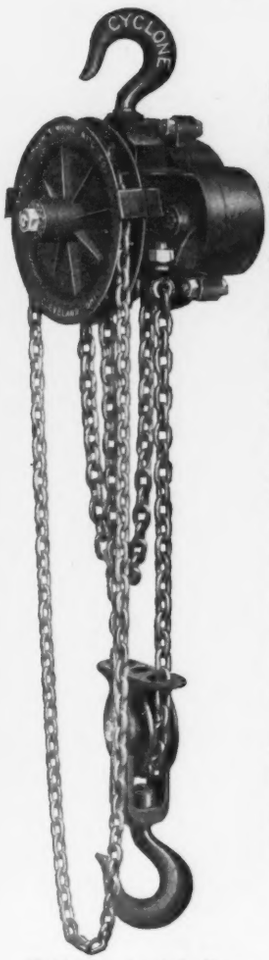
WITH SELF-LUBRICATING BEARINGS

ALL CUT GEARS



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Patent Gyrating drive through Roller Bearing Eccentrics gives Maximum Efficiency and Durability. Design entirely different from all others. Few wearing parts. Does not get out of order.

The Bearings of the Hoist have Graphite Bronze Bushings. They are self-lubricating, they require no oil, and will run indefinitely without cutting.

There is the least possible friction loss, the efficiency averaging nearly 80 per cent. It can therefore be geared to a higher speed than any other hoist with no greater hand wheel pull.

When there is no load the hand wheel may be spun in either direction.

When the hand chain is released the **Automatic Brake** immediately locks the block so that the load is safely held at any point. It may be readily lowered, however, by a reverse pull on the hand chain.

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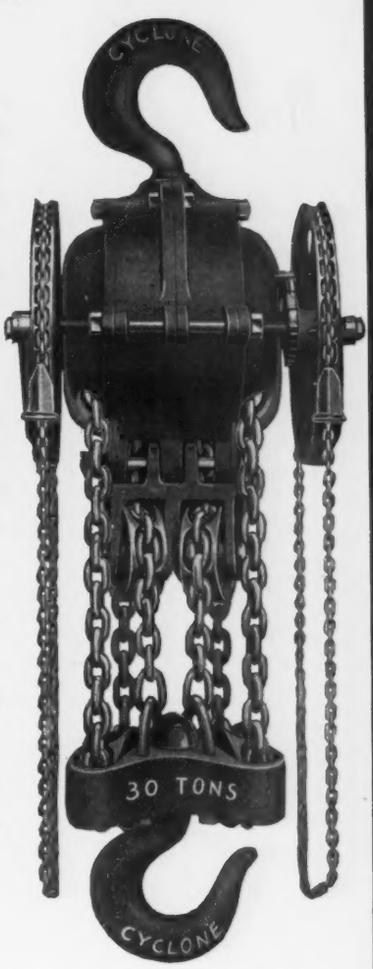

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Sectional View

Send for Catalog Illustrating
Full Line of Hoists and Trolleys

The Chisholm & Moore Mfg. Co.

CLEVELAND, O., U.S.A.

Sectional View

Chain Hoists and Trolleys

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(TRADE MARK)

Chain Hoist

WITH

Recently Improved Brake

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This Hoist has been on the market a number of years, with steadily increasing sales, and has recently been improved by equipping it with a new and very efficient automatic brake, which absolutely locks the load at all points and yet permits a very free and smooth lowering movement. It has spur gears and fewer working parts than any other hoist except the Direct Differential.

In speed and efficiency, this Hoist stands midway between the Screw Hoist and the Cyclone High Speed Hoist; that is, its efficiency is 55 per cent. as against 40 per cent. for the Screw Hoist, and it averages on the several sizes fully one-third higher speed. It is a good hoist for general work and will stand hard usage. The chains are made of the highest grade of material and are tested and stretched to gauge on a pull 100 per cent. greater than the maximum load they are intended to carry.

"Direct"

Differential Pulley Blocks

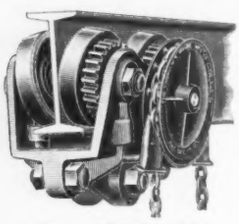
1-4 ton to 3 tons. All blocks are thoroughly tested

Fig. 101. "Direct"

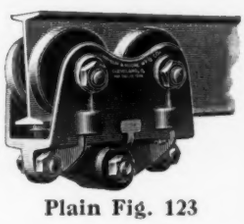
"MATCHLESS"

Adjustable Malleable Frame Trolleys

(Patented December 17, 1907)



Geared Fig. 122



Plain Fig. 123

These Trolleys are readily adjustable to the different sizes I Beams specified in price list. They have flangeless track wheels with vertical guide rollers.

The track wheels have hardened steel roller bearings (hardened steel bushings pressed into the wheels, hardened steel axles and hardened steel rollers enclosed in brass cages).

On the Geared Trolley, the gears are cut. They work very freely and have a large safety factor.

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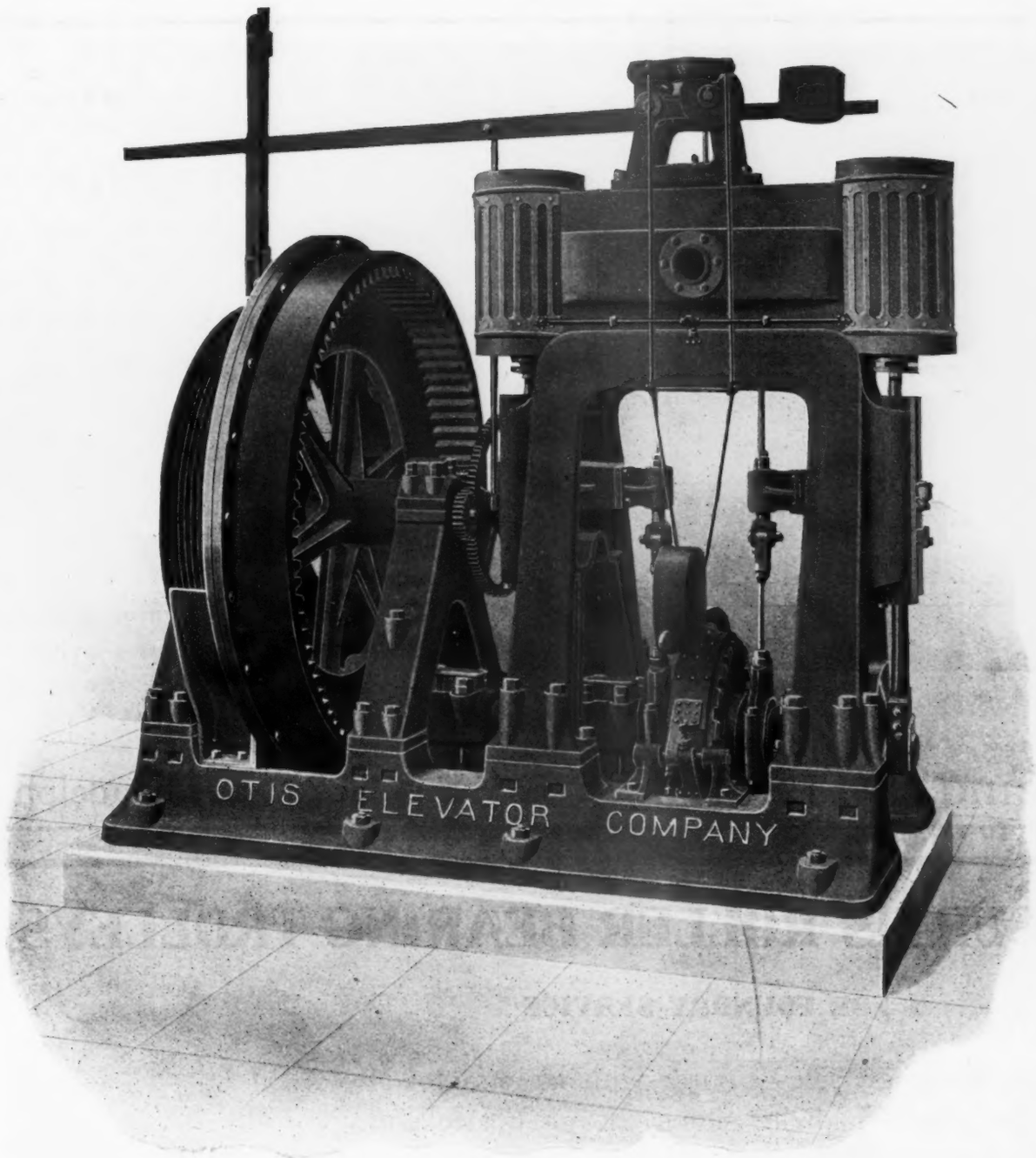

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Also constructed with friction clutch drum and cut-off valves

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TYPICAL BRASS FOUNDRY SYSTEM

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As attained by the

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A system of converting a waste into a positive saving

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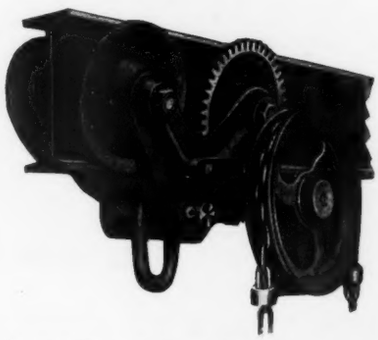
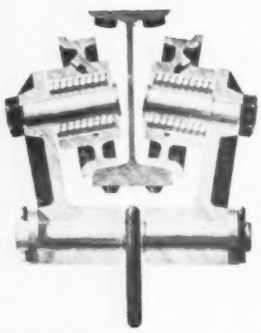
FOR FOUNDRY SERVICE

are absolutely safe—figured with large factor of safety; self-equalizing side frames are of steel and wheels run at right angles to beam flanges.


Single I Beam Geared Trolley with Pendant Hand Chain

Give Permanent Satisfaction

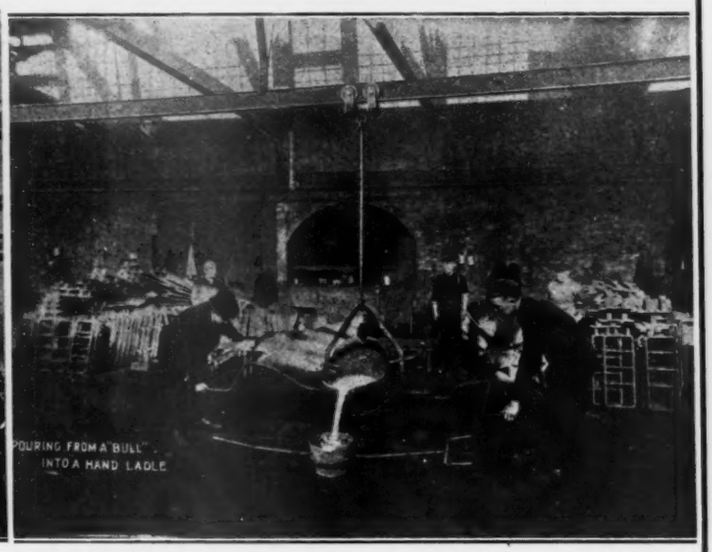

Showing inclined wheels and sides adjustable for different size beams.

Note the large diameter wheels with machined treads and flexible roller bearings working in hardened steel bushings. This means least possible friction and greatest efficiency. **Made adjustable for different size beams up to 20 inch and up to 20,000 lbs. capacity.**

CURTIS & CO., 1545 Klenlen Ave., St. Louis, Mo.

New York Office: 30 Church St.

WEIGHING THE FINISHED CASTINGS


POURING FROM A "BULL" INTO A HAND LADLE

Moyer Tramrail

One man and a Moyer Tramrail will carry your pig, scrap and coke to the cupola.

One man and a Moyer Tramrail will carry the Molten Metal to the moulders.

One man and a Moyer Tramrail will carry all the cores from the core room to the floors.

One man and a Moyer Tramrail will carry the sand to the moulders.

One man and a Moyer Tramrail will carry the castings to the cleaning room.

One man and a Moyer Tramrail will carry the cleaned castings to the assembly room, the stock bins or the shipping platform, as the case may be.

What's it cost **your** way ?

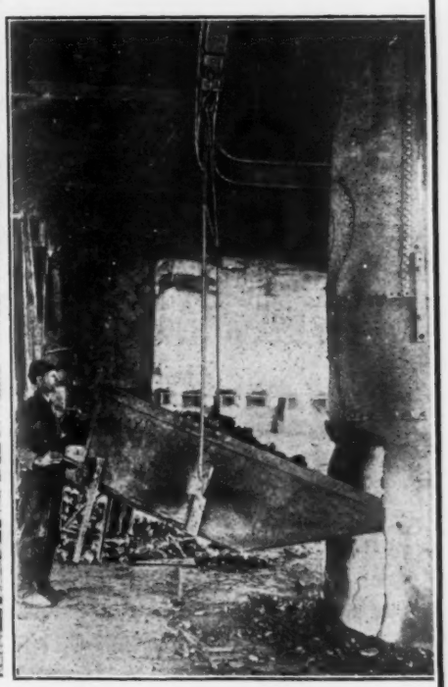
Bulletin 102A tells the whole story. May we send you a copy ?

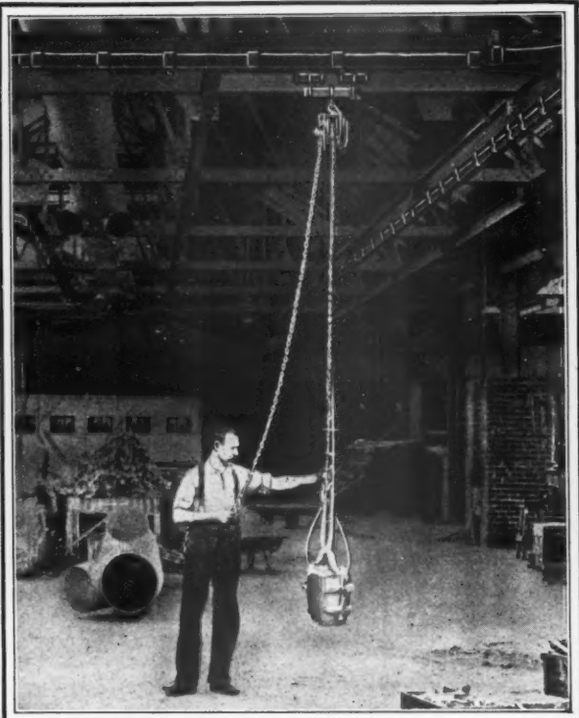
Please address

Moyer Tramrail Dept.
J. W. PAXSON CO.
1023 No. Delaware Ave.
PHILADELPHIA

LOADING THE RUMBLERS

LOADING THE TROLLEY RACK IN THE CORE ROOM





Overhead system of tracks and switches permitting the Triplex Block to transport material to any point.

Overhead Beats Underneath

With a Triplex Block one man alone can pick up a pot of metal or a twenty ton casting, or a core.

And with a Triplex Block hung from a trolley and running on an overhead track, he can transport his load wherever the track goes.

And there's a big difference between the smooth running Triplex Block on a trolley and the rumbling, jumbling truck on the floor.

Beside the saving of labor and time, there is the freedom from accident.

A Triplex Block never tips over and never lowers its load until you are ready.

Chain Blocks:

4 Styles: Differential, Duplex, Triplex, Electric.
42 Sizes: One-eighth of a ton to forty tons.
300 active stocks: ready for instant call all over the U.S.

The Book of Hoists tells much—for a postcard

The Yale & Towne Mfg. Company

Only Makers of Genuine *Yale Products*

9 Murray Street, - - New York

Local Offices:

Chicago Philadelphia Boston San Francisco

Metal Core Racks

A MONEY-SAVING EQUIPMENT

FIREPROOF, CLEAN AND DURABLE

An Installation that Wears and Possesses a Permanent Value

COST VERY REASONABLE

List of a few who are using these racks:

Buick Motor Co., Flint, Mich.
Michigan Motor Castings Co., Flint, Mich.
Detroit Stoker & Foundry Co., Detroit, Mich.
American Motor Castings Co., Detroit, Mich.
Fairview Foundry Co., Detroit, Mich.

Made by **TERRELL'S EQUIPMENT CO.** ANN ST.
GRAND RAPIDS, MICH.

Two Books

Every Foundry and Pattern Shop Should Have.

FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp,, 150 illus. Cloth binding. A practical guide to modern methods of molding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. **Price $1.00**

PATTERN MAKING. By James Ritchey. Instructor in Wood Working, Armour Institute of Technology. 160 pp., 250 illus. Cloth binding. An extremely valuable working guide for Wood and Metal Workers, Molders, etc. The various tools and machines used in woodworking are fully described and illustrated, as are also the different methods of building up and finishing patterns and of molding. **Price $1.00 Postpaid**

Book Department

Penton Publishing Co.

Cleveland, Ohio

"Those Coatesville Ridgways Are Bully Fellows!"

That's what the "Old Man" himself said when we had gotten done changing all his elevators to the Steam-Hydraulic.

We hadn't done anything personally except write letters and make elevators.

But we had written with a smile and the Steam-Hydraulics had spoken for themselves by their splendid performance in the Old Man's foundry.

And the Old Man was happy with himself and the whole world.

And of course "The Ridgways are Bully Fellows."

So you see how it is we have so much fun in business and why every customer is more than a customer.

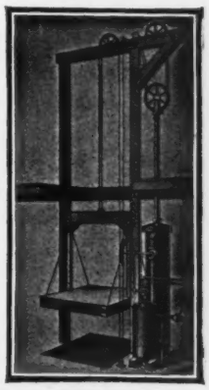
When a man has been years troubled with elevators, paying big repair bills and having this the one great sore spot of his organization, he is apt to shout the praises of the man who cures his trouble

And gives him elevators that go at virtually no cost.

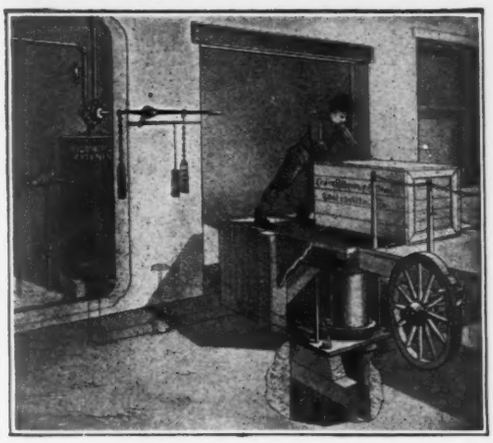
We would like very much to add you to the goodly company of Steam-Hydraulicks, and if you will write us we have the literature which tells what it means for a foundryman to

Hook 'er to the Biler

DIRECT ACTING



DOUBLE GEARED



THE GREATEST OF MONEY MAKERS

CRAIG RIDGWAY & SON COMPANY

Coatesville, Pa.

No. 230 Triple Deck Oven Car

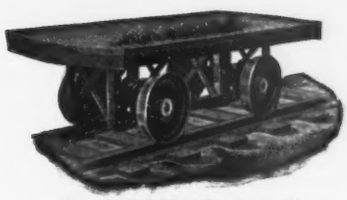
The Atlas Car & Mfg. Co.

CLEVELAND, OHIO

Manufacturers

No. 600 Steel Dumping Bucket

Small Cars of all kinds for various purposes, Sand Buckets, Turntables, Rails, Frogs, Switches, Etc.



No. 2025 Flat Foundry Car

Foundry Equipment a Specialty.

Here's the greatest Chain Block ever offered

Steel Parts—Sizes ½ to 20 tons

to the foundry trade. For molding machine and ladle work it is a revelation on account of its smooth, rapid lifting and high efficiency

TRIBLOC CHAIN HOISTS

Cost less—the Peer of all

Sent on trial at our expense—Catalog for the asking

MANUFACTURED BY: FORD CHAIN BLOCK COMPANY

135 North Second Street PHILADELPHIA

A D SAND BLAST

Cost less than other machines

Will give better results

Easily handled

Write for circular and specifications

Made in three standard sizes

We Will Send Machines on Trial

DESIGNERS OF

Portable Compressed Air Outfits, A D B Air Paint Sprayers, Operators' Helmets, Pneumatic Hose, Coupling, Nozzle Tips and Sand.

American Diamond Blast Co.

50 Church Street, New York

Mr. Foundryman—

You do not have to invoke the aid of a dictionary to understand our plain talk.

The Kelly High-Pressure Double-Hose Sand Blast stands on, and will demonstrate in practice against the entire single-hose field, low-pressure and so-called high-pressure, the following *irrefutable statements of fact*:

Being the only machine that can maintain uniform nozzle pressure, *it is the only High-Pressure Sand Blast.*

Being the only sand blast in which a fixed volume of air is used at a given pressure, *it is the only economical sand blast at any pressure.*

Being of a scientific design its principles can be adapted to any single hose machine, imparting to it its economy of air and sand and additional efficiency and speed.

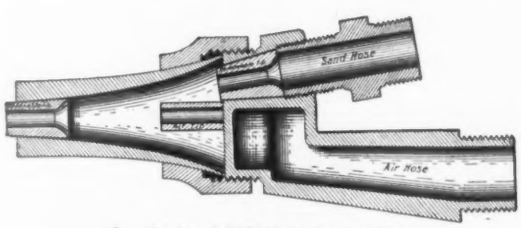
Of what avail is it to use a high-pressure if you cannot maintain it? This is the drawback to all single hose machines.

In all single-hose outfits the volume of air consumed increases and the pressure decreases as the operation progresses.

Let us therefore transform your single-hose equipments by adapting the Kelly principle to them and save you the loss of scrapping them.

Wearing parts of machine reduced to removable parts of nozzle, of negligible cost.

Lowest up-keep charges assured.



Cross Section of the Kelly Sand Blast Nozzle

Complete Automatic Sand Blast Equipments installed to meet the most exacting conditions. Fully guaranteed.

High Pressure Sand Blast Company

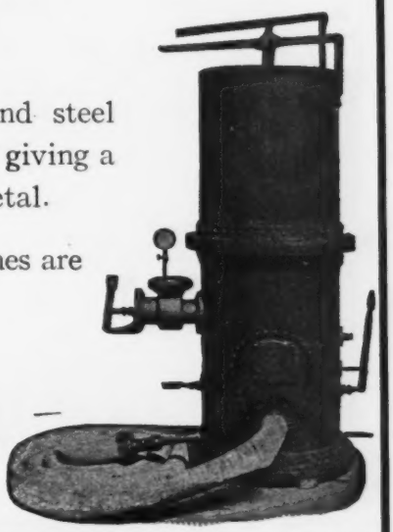
20 Broad St., New York, N. Y.

Sand Blast Tumbling Barrels Increase Your Dividends

Sand Blast Tumbling Barrels are a sensible, practical machine, unequalled for the rapid and thorough cleaning of small castings. Castings cleaned by sand blast take first rank in the market.

The Improved Sand Blast

cleans perfectly brass, iron and steel castings, removing all scale, and giving a beautiful satin finish to the metal.



Investigate and you will become convinced that these machines are potent factors in your business.

Write for catalogues and information. *"Do it now."*

TILGHMAN-BROOKSBANK SAND BLAST CO.

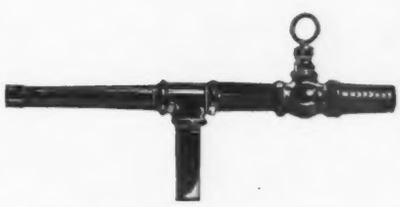
1126 South 11th St., PHILADELPHIA, PA.

We will send you this Sand Blast on 10 days free trial

At the end of that time send us your check or the machine

This sand blast has no equal at any price. A trial will convince any foundryman of their worth, and that is why we dare make the above offer.

NIAGARA



SAND BLAST

NO TANKS ARE REQUIRED—no waste. **JUST ATTACH TO AIR LINE AT THE POINT NEAREST TO THE WORK.** Sand is syphoned direct from pit or barrel. It's the simplest, fastest and most effective sand blast on the market. It does the work and does it quickly and well.

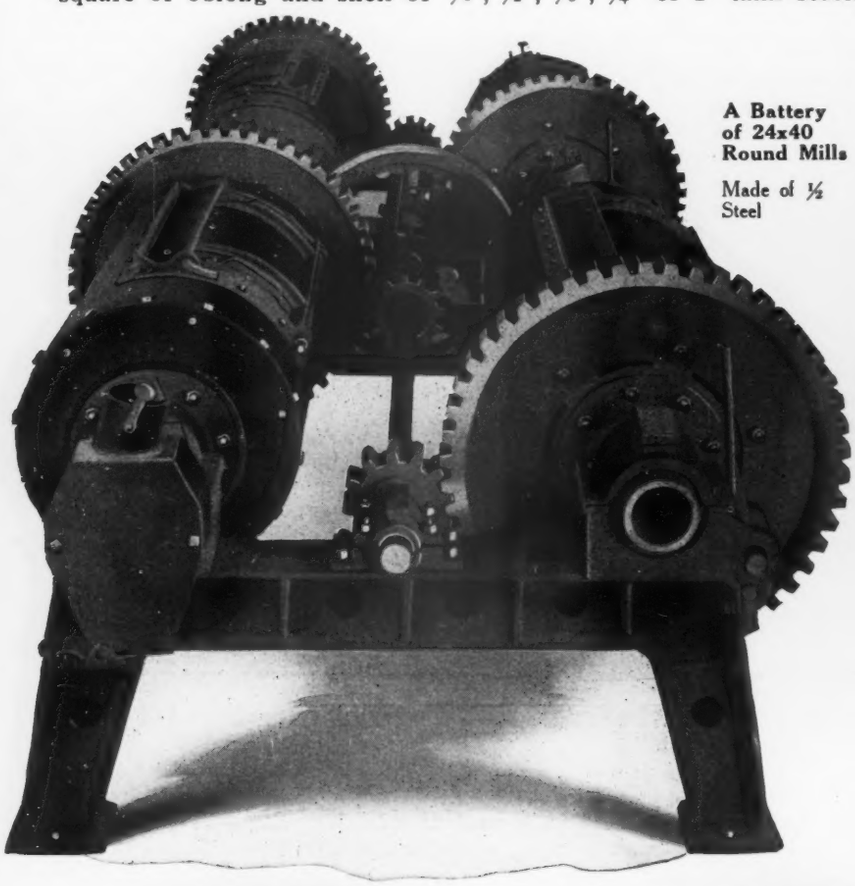
The price is $15.00 f. o. b. Buffalo and the entire apparatus weighs but six pounds

NIAGARA DEVICE COMPANY

Address Foundry Department **BUFFALO, N. Y.**

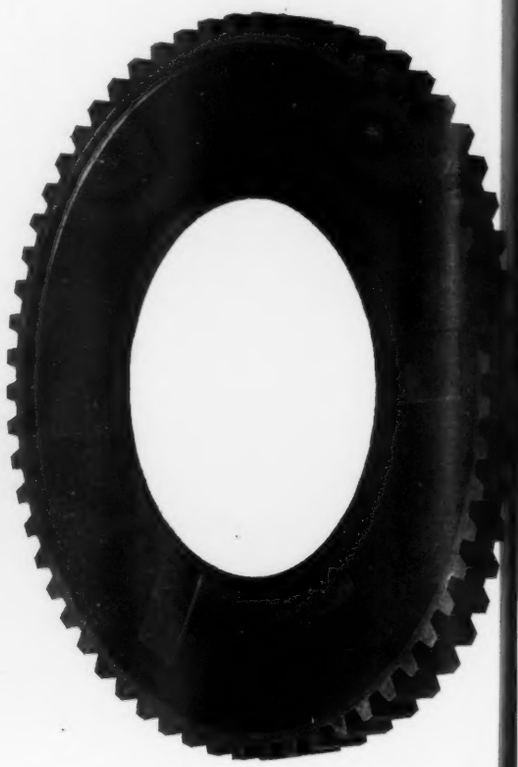
SUPERIOR STEEL EXHAUST TUMBLING MILLS

THESE MILLS can be arranged single or double file, and are driven from one shaft, which runs continually. There are no belts to shift or throw off. Each mill can be stopped and started independent of all others by means of lever shown. All parts fitted to shell around opening are MALLEABLE IRON and door is fastened in place by a malleable iron clamp. Clamp is held in place by a round bar of steel passing through both side pieces and over malleable iron clamp, no wrench being used to take off door. Nothing but a hammer or bar of steel is necessary. Mills made round, square or oblong and shell of ⅜", ½", ⅝", ¾" or 1" tank steel.



A Battery of 24x40 Round Mills

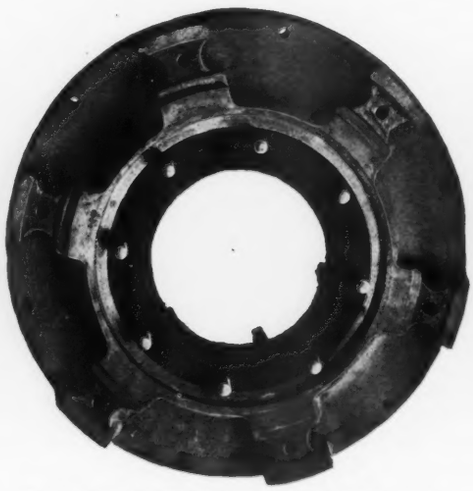
Made of ½ Steel



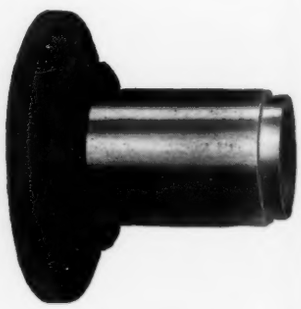
All gears bored and turned to template

Note increased weight and pitch of teeth

View of Steel Dust Plate attached to head
Full size of head of mill.



Front view of Mill Head, showing bosses turned to receive gear and journal.



Journal made separate from head.

In case of replacement not necessary to take out head of mill.

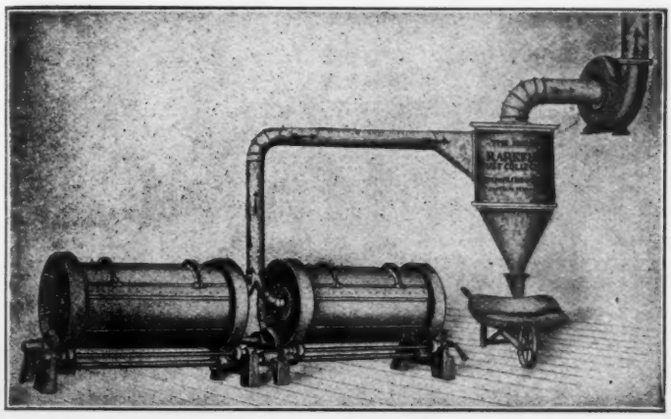
Journals turned and drilled to template—WITH ENLARGED OPENING.

Additional valuable features in the superior line of our Steel Exhaust Tumbling Mills besides that are shown by above cuts that merit special attention: Automatic Sand Trap, Babbitted Self-Oiling Bearings, Dust Box with Packed Joint—self-adjusting to wear of journal. Cover of all round mills made to fit opening and *flush* on *inside* of mill with steel strap frame covering joints—making door much lighter to handle. All parts *interchangeable*.

WRITE FOR CATALOGUE

Manufacturers also of Water Tumbling Mills, Cinder Mills, Dust Arresters for Tumbling Mills and Sand Blast and Hard Iron Stars.

CLEVELAND NICKEL WORKS, CLEVELAND, OHIO



The Morse Rarefied

DUST COLLECTOR

For Sand Blast — Tumbling Mills — Emery Wheels

No Sand passes through the Fan—No cutting out

DUST DISCHARGED AS FAST AS COLLECTED

Shipment on sixty days trial to any part of the United States.

M'f'd Exclusively by

THE KNICKERBOCKER COMPANY

Jackson, Michigan

Clean Your Castings with the simple and positive

Drucklieb Injector Sand Blast Apparatus

It will cut your production costs. Give us a chance to demonstrate that its excellent reputation is well founded and increasing daily. We will install outfit to suit your conditions and show you a saving.

Write for "Sandcraft."

Made by J. M. BETTON, 178 Washington St., NEW YORK.

SALES AGENTS: Harron, Rickard & McCone, Ltd., San Francisco and Los Angeles, Cal.; Corby Supply Co., St. Louis, Mo.; The E. A. Kinsey Co., Cincinnati, O.; Frederic B. Stevens, Detroit, Mich.; The Caldwell Bros. Co., Seattle, Wash.; Central Foundy Supply Co., Columbus, O.; The Fairbanks Co., New Orleans, La.; Canadian Rand Co., Montreal and Toronto, Canada; Fenwick Freres & Co., Paris, France; Consolidated Pneumatic Tool Co., London, Eng.; Pneumatic Tool Co., St. Petersburg, Russia; Agar, Cross & Co., Ltd., Argentine Republic.

We Sell Sand Blasts

No Frills No Theories No Big Talk

¶ You cannot afford to swallow all the claims you might read in an advertisement.
¶ You cannot afford to pay big advertising bills for us.
¶ You cannot afford to pay the foolish expense incident to sending Blasts on approval, to satisfy the curiosity of others.

WE SELL DIRECT

No Middleman No Commissions Cut All Corners

30 days net; 2% 10 days. Prices in Plain Figures F. O. B. New York

No. 1 Blast, 500 lbs. Sand Capacity, $100.00
No. 2 Blast, 1000 lbs. Sand Capacity, $145.00
No. 3 Blast, 2000 lbs. Sand Capacity, $200.00

¶ With each Blast we furnish 15 feet operators' hose, one nozzle holder, 12 nozzles, one sand blast helmet. Double set of accessories with No. 3 Blast for two operators.

PROMINENT USERS OF OUR BLASTS
Is their judgment worth anything?

Baldwin Locomotive Works, Philadelphia, Pa.	Three No. 3 Blasts
Richardson & Boynton Co., Dover, N. J.	No. 2 and No. 3 Blasts
W. H. Mullins Co., Salem, Ohio	No. 1 and No. 3 Blasts
Thatcher & Son, Albany, N. Y.	No. 1 Blast
Ford Motor Co., Detroit, Mich.	Two No. 3 Blasts
International Harvester Co., Akron, O., and Deering Wks., Chicago,	Two No. 2 Blasts
J. I. Case Threshing Machine Co., Racine, Wis.	No. 2 Blast
Gisholt Machine Co., Madison, Wis.	No. 2 Blast
Winona Technical Institute, Indianapolis, Ind.	No. 2 Blast
Chickasaw Iron Works, Memphis, Tenn.	No. 1 Blast

Our Blasts are right and our Prices are right

SEND FOR CATALOGUE

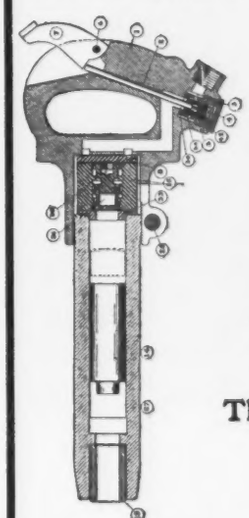
Farnham Sand Blast Co.

Metropolitan Tower New York City

Cleveland AIR TOOLS

CLEVELAND SPECIAL

AN IDEAL FOUNDRY HAMMER



Built to Stand Hard Use and Rough Handling.

The Hammer is Fitted

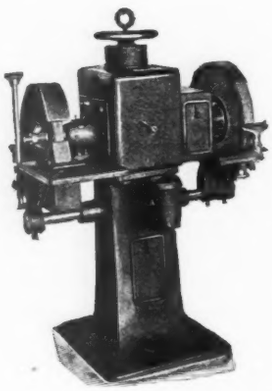
with a TWO-STAGE Throttle Valve, AIR-Balanced Type permitting Operator to regulate the AIR Supply and to increase or diminish force of blow as desired.

THE CLEVELAND PNEUMATIC TOOL COMPANY

New York Philadelphia **Cleveland, Ohio** Chicago St. Louis

Stow Mfg. Co.

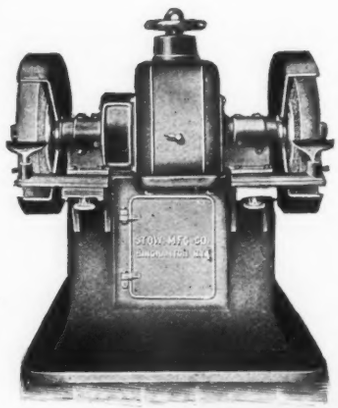
Binghamton,
N. Y.



A Line of EMERY GRINDERS we build!

Both PORTABLE and STATIONARY

Gen'l European Agts.
Selson Engineering Co.,
85 Queen Victoria St.,
London, England



We would call particular attention to the fact that our Electric Grinders are driven by our MULTI-SPEED ELECTRIC MOTORS having peculiar advantages for this work.
They are fully inclosed.
Have a wide range of speed.
Give every possible speed between highest and lowest points.
Are mechanically regulated.
No rheostats to clog with dust and burn out.

"Holds the Corners--Cuts Faster" "Requires Less Dressing"

Up in Milwaukee there is a Manufacturer who takes a great interest in his grinding department—
He has experimented carefully with all kinds of grinding wheels and now uses Carborundum exclusively.

Here's what he says:

"The Carborundum wheels we are now using are just about 100 percent better all around, than any other wheel we have ever tried—They hold corners well, cut faster and require very little dressing."

Would you like to have a wheel of that kind in your grinding department?

The Carborundum Company
Niagara Falls, N. Y.

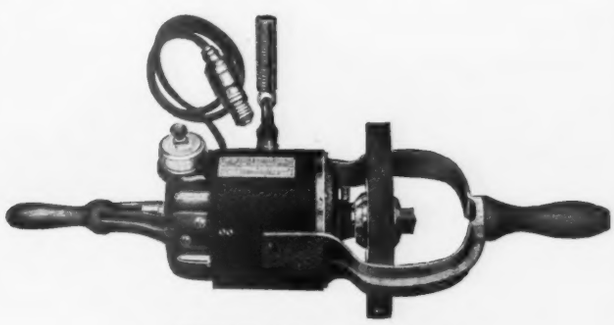
U. S. Electric Hand Grinders

Are great Time and Labor Saving Tools for grinding castings of all kinds. Instead of chipping and filing by hand, attach to any lamp socket, and grinder is ready for use. Type O Grinder is handy for finishing up metal patterns.

SENT ON TRIAL

TYPE O GRINDER---4 Sizes

OB -	WHEEL	5 x ¾"
O -	"	6 x 1"
OO -	"	8 x 1"
OM -	"	12 x 1¼"



TYPE NN---4 Sizes

RN -	WHEEL	6 x ⅝"
NN -	"	8 x ¾"
NK -	"	10 x 1"
NE -	"	12 x 1¼"

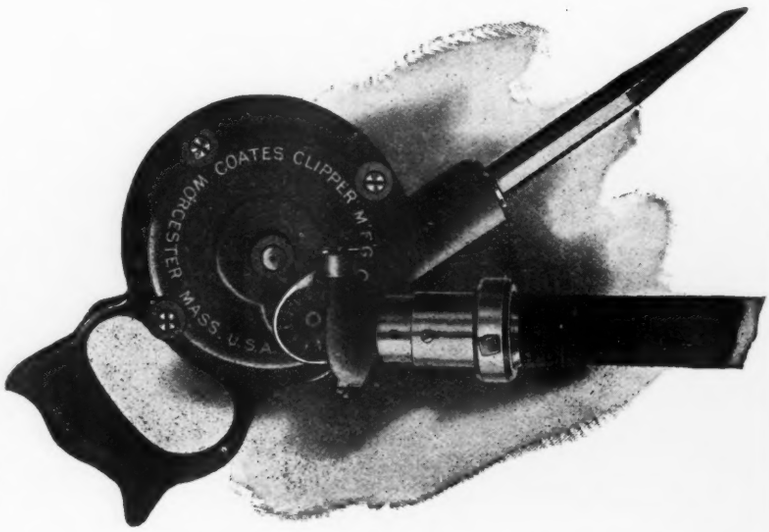
Write for Catalogue showing complete line of Electric Hand Drills and Bench Grinders

THE UNITED STATES ELECTRICAL TOOL CO.
8th and Evans Street CINCINNATI, OHIO.

COATES Electrically Driven HAMMER

This Shows Work Done by Coates Hammer
(Cut One-Half Size)

Furnished for Any Electrical System



It is the talk of the electrical and mechanical circles.

Use same outfit for grinding, drilling and clipping.

The result of seven years study and experimenting.

As effective as a pneumatic hammer.

No valves, springs or triggers to fool with. Just the thing for the foundry.

Half H.P. motor runs it.

Initial expense *small.* Running expense *small.* Cost of power used *small.*

Write for further particulars to-day.

Send for Bulletin 40

COATES CLIPPER MFG. CO.

WORCESTER, MASS., U. S. A.

This tells the story

Kroeschell-Schwartz GYRATING FLAME CRUCIBLE FURNACE

PATENTED JUNE 30th, 1908, JANUARY 19th, 1909, FEBRUARY 2nd, 1909

Indianapolis, Ind., Dec. 14th, 1909.

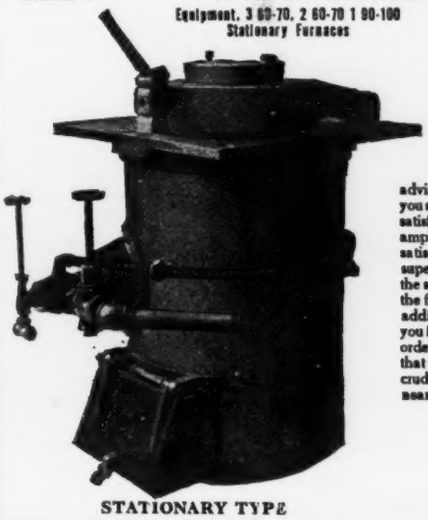
Kroeschell Bros. Co., Chicago, Ill.

Gentlemen:—In reply to yours of the 11th inst. in regard to the Kroeschell-Schwartz Crucible Furnaces, we beg to say that we have five of the No. 70 furnaces, and one of the No. 100 furnaces, and find them satisfactory in every way. We are melting Brass, Bronzes and Aluminum in these furnaces with a very low percentage of Oxidization. We get from six to eight heats per day from each furnace.

Yours Truly, PIONEER BRASS WORKS.

C.C.M. V. Per Chas L. Miller, Vice-Pres.

Equipment, 3 60-70, 2 60-70 1 90-100 Stationary Furnaces



STATIONARY TYPE

Kroeschell Bros. Co., Chicago, Ill.

Gentlemen:—Replying to your favor of the 14th inst., in regard to the Kroeschell-Schwartz Crucible Oil Furnaces, will say since we have tried out two of your furnaces for three months, we have decided to place an additional order for six No. 70 and one No. 125 tilting furnace.

We have been operating these nine furnaces for about four months with good success, and find it a great saving over the old way of melting. We are very well pleased with them, and they do all you claim. Yours very truly,

(Signed) The Langsenkamp-Wheeler Brass Works, Indianapolis, Ind.

Equipment, 8 60-70 Stationary Furnaces, 1 Tilting Furnace

FUEL OIL OR GAS

Burlington, Wis., Dec. 13, 1909

Kroeschell Bros. Co., Chicago, Ill.

Gentlemen:—Replying to your favor of the 10th inst., we beg to advise that the two Kroeschell-Schwartz stationary furnaces, which you sent us recently, with the latest patent attachment, give excellent satisfaction. As this is our third order for furnaces, we have had ample opportunity to know what your furnaces will do. We are satisfied, however, that the last two furnaces which you sent, are superior to any of the others. The additional force of air given by the small pipe which you have inserted in the rear of furnace gives the flame greater power, and in revolving around the crucible gives additional heat without using additional fuel. We wish to thank you for the prompt manner in which you have handled our various orders, and can assure you that we appreciate same. We believe that you have the best furnaces on the market today, operated with crude oil and air. We should like to have you call sometime in the near future to inspect our new foundry. With best regards, we remain,

Yours very truly, Burlington Brass Works.

S. Jacobsen, Vice President.

Equipment, 5 50-60 Stationary Furnaces.

TILTING TYPE

Hamilton, Canada, Nov. 30, '09

Messrs. Kroeschell Bros., Chicago, Ill.

Dear Sirs:—We herewith enclose our check for the last three furnaces that we bought from you. These are now installed, and we have given them a good trial, and find them very satisfactory. We find them very economical in the use of gas. We expect to need one or more shortly, and shall be pleased to communicate with you when we are ready for the same.

Yours truly,

Tallman Brass & Metal Co.

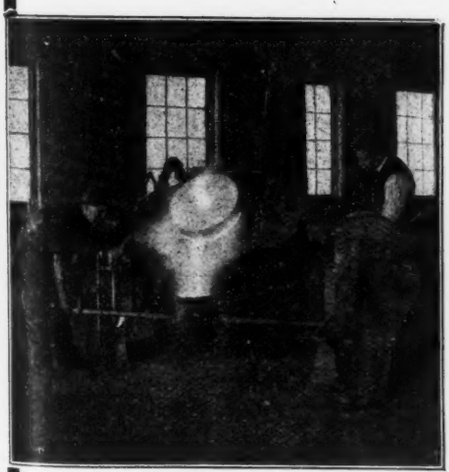
Per C. H. Tallman, Manager.

Equipment, 4 60-70 Stationary Furnaces, 1 Tilting Furnace

KROESCHELL BROS. CO.,

440 WEST ERIE STREET CHICAGO, ILLINOIS

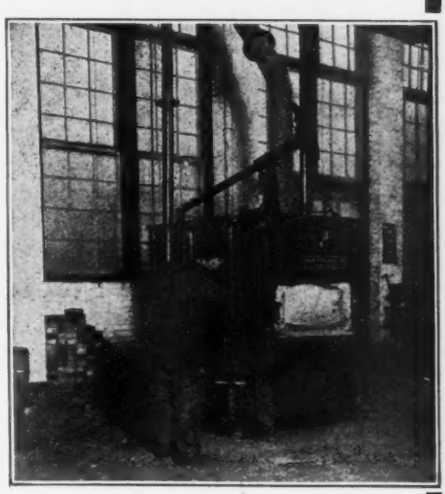
ORIGINAL ROCKWELL FURNACES



FOR MELTING

- COPPER
- BRASS
- BRONZE
- ALUMINUM
- SILVER
- GOLD
- MONEL METAL
- etc., etc.

Write for Catalog No. 18-A.

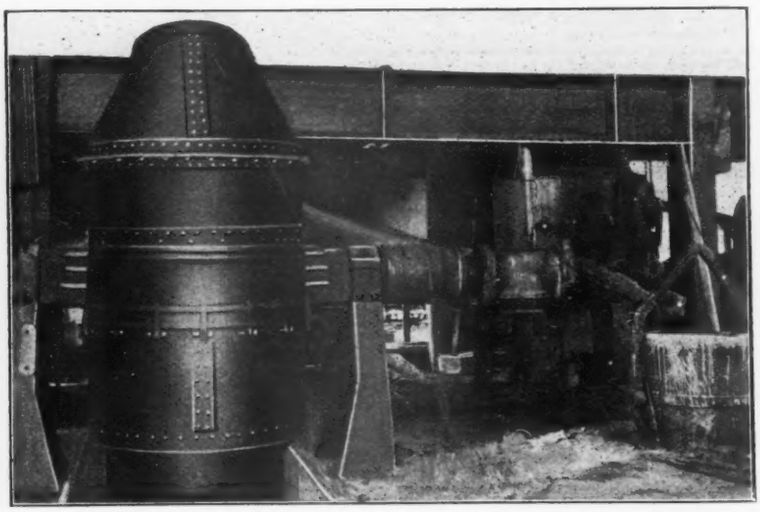


W. S. ROCKWELL COMPANY, Hudson Terminal Building

50 CHURCH STREET - - - - NEW YORK

W. S. ROCKWELL, Prest.

STEEL CASTING CONVERTERS



Made in any size;
700 lbs. to 15 tons.

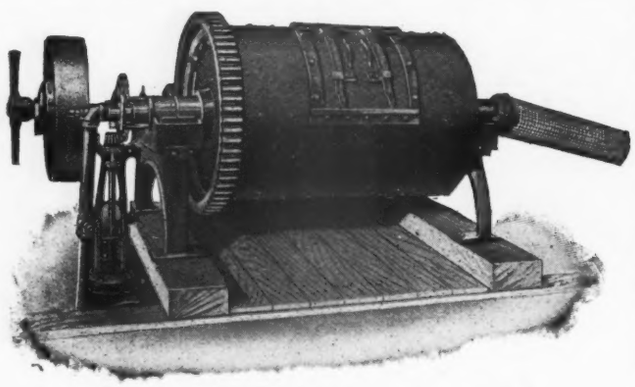
Our designs are being imitated by our competitors and this is the best possible proof of the superiority of the SECO Converter.

Write for further information.

STOUGHTON ENGINEERING COMPANY,
165 Broadway, NEW YORK

Pittsburgh: 439 Third Ave. **Philadelphia: 1007 Betz Building**

Save Your Iron



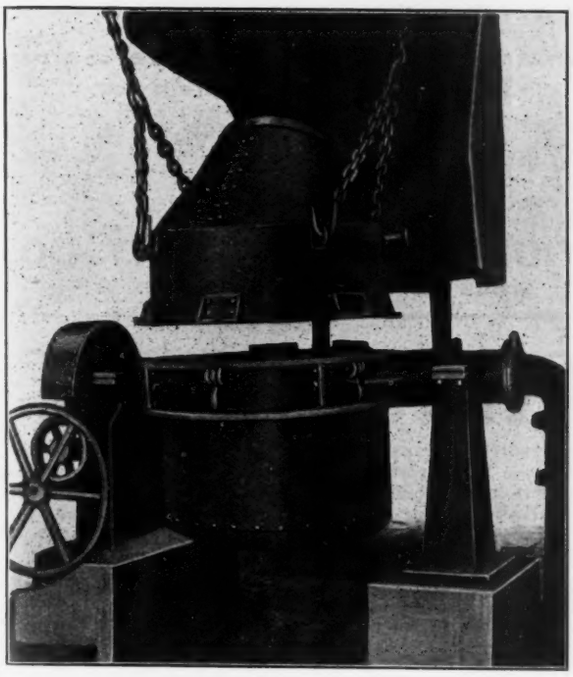
SLY'S PATENT IRON CINDER MILL
Patented, No. 514097. **Patented, 841728**

Sly's Patent Iron Cinder Mill will save 95% of the iron and 75% of the coke contained in your cupola dump, and gangway scrapings. Iron is valuable, then why throw it in the dump? Iron recovered by this Mill is better than machinery scrap. Study economy in a foundry, and your profits will increase accordingly. Mill will pay for itself three or four times every year, and we have records of Mill paying for itself twelve times a year. Let us know amount of your daily melt, and we will quote.

We also make Exhaust Cleaning Mills, Dust Arresters, Resin Mills and Improved Foundry Equipment.
Write for General Catalog R.

The W. W. SLY MFG. Co., Cleveland, O.

Bretaud Steel Converters



Double Your Production

AND REDUCE TIME AND EXPENSE
OF REPAIRS TO A MINIMUM

THEIR OPERATION IS PRACTICALLY CONTINUOUS
(Patent Applied for)

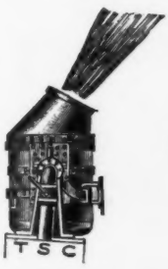
Built in 3 Sizes

1-TON 2-TON 5-TON

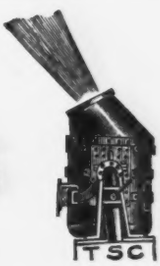
COMPLETE STEEL CASTING PLANTS
DESIGNED, ERECTED AND STARTED
BY EXPERTS

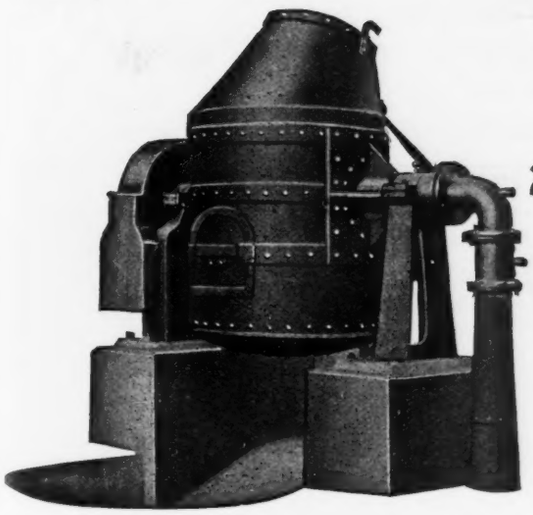
WRITE FOR PARTICULARS

J. V. BRETAUD, 488 Cass Avenue, DETROIT, MICH.



THE MANUFACTURE OF STEEL CASTINGS
BY THE
TROPENAS CONVERTERS
NEW PATENT





NEW BABY CONVERTER
1000 to 1500 lbs. capacity

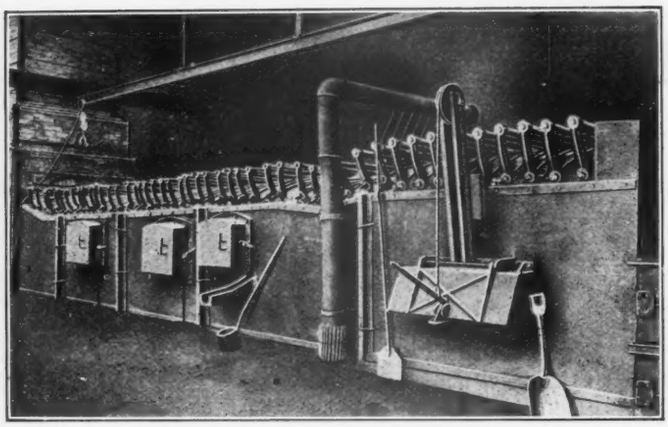
2 Ton — NEW TYPE — 3-5 Ton
Write for Price of Equipments

GOOD STEEL GUARANTEED
We will instruct you to make good steel

TROPENAS STEEL CO.
NEW CASTLE, DEL.

Six U. S. navy yards, several foreign government arsenals equipped with our process

OVER ONE HUNDRED TROPENAS CONVERTERS SOLD



THE UP-TO-DATE

MELTING FURNACE

FOR MALLEABLE IRON

Capacities up to 30 tons per heat

Drawings or Iron Work Complete Cheaper Than You Can Duplicate Them

SPECIAL FEATURES

Long narrow hearth. Light trussed bung clamps. Wide fire door. Liberal grate area. Buck stays below top of furnace. Heat proof skimming doors. Every detail strictly up-to-date.

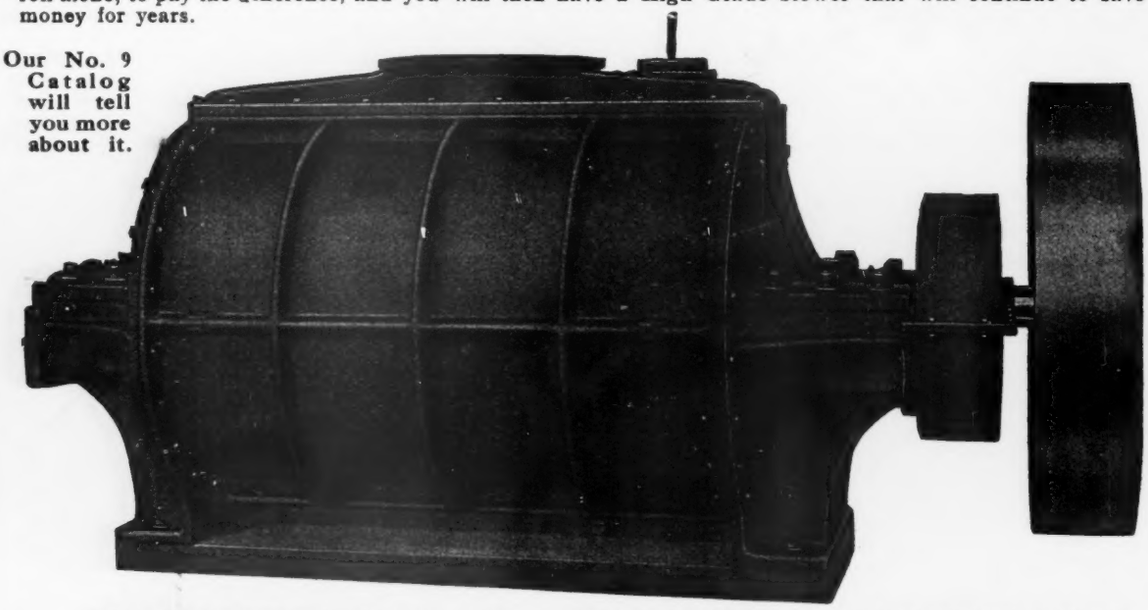
FOUNDRY EQUIPMENT CO.

245 Military Road, BUFFALO, N. Y.

WE CAN POSITIVELY SAVE YOU MONEY

If you need a machine to furnish blast in your foundry cupola, profit by the experience of others and *don't buy a Fan to save money.* The first cost of a fan may be less than a Positive Pressure Blower, but unless the conditions in your foundry, are different from others a Connersville Blower will, in a short time, save you enough on your pay-roll alone, to pay the difference, and you will then have a High Grade blower that will continue to save you money for years.

Our No. 9 Catalog will tell you more about it.



ASK US QUESTIONS

CONNERSVILLE BLOWER COMPANY

536 Monadnock Block
CHICAGO, ILL.

HOME OFFICE AND WORKS:
Connersville, Indiana

50 Church St.,
NEW YORK CITY

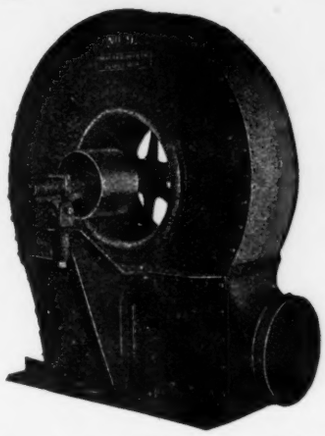
EXETER PRESSURE BLOWERS

Especially designed to force a strong, steady blast for cupolas, furnaces, forge fires, sand blast machines, etc.

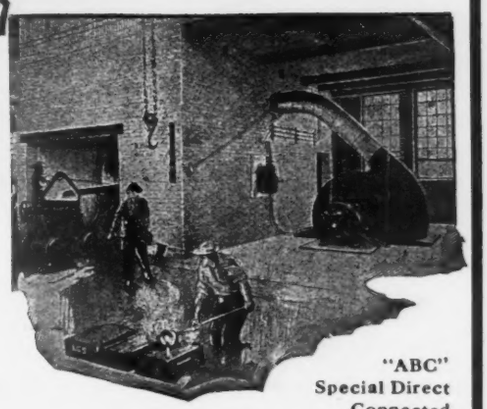
Their excellent construction and the self-oiling box permit of high speeds without heating. All users back our strong claims for Exeter Blowers.

EXETER MACHINE WORKS

BOSTON, MASS.



Regular Type "P" Pressure Blower

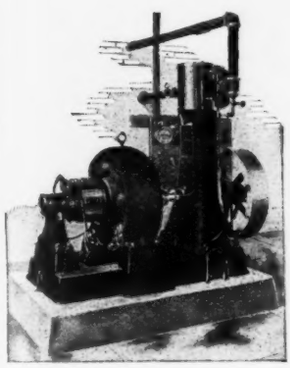


"ABC" Special Direct Connected

"ABC" ELECTRIC CUPOLA BLOWERS

We have solved the problem of adapting the blower details to **standard motor specifications**---either direct or alternating current---with the result that up-to-date foundries are equipping their cupolas with "ABC" Electric Blowers.

Bargain lists are filled with so-called Positive Pressure Blowers, and the reason is this---"ABC" Centifrugal Blowers with direct connected motors are more efficient, which means **power saving**. We guarantee Steady Blast, Uniform Volume and Sustained Pressure.



GENERATE YOUR OWN ELECTRICITY

An "ABC" Vertical Enclosed Self-Oiling ENGINE direct connected to any efficient generator, will electric light your Plant and run fans, etc. If you are now buying electric current, an "ABC" Engine will be a 25% paying investment. We will gladly prove the above to interested parties, without obligation to purchase. Write to us.

Ask for our new book "Blower Equipment for the Modern Foundry"

AMERICAN BLOWER COMPANY
DETROIT, MICH.
U. S. A.

Our Engineering department is at your disposal.

Buffalo Blowers

For Cupolas, Furnaces and Forge Fires
Electric or Steam Driven
Direct Connected—No Belts—No Gears

Turbine Driven Pressure Blower

¶ Requires less attention than an engine driven unit. Beyond occasional oiling, the turning on or off of the steam to start or stop, there is nothing to do. Consumes less steam; more economical to operate.

¶ This unit delivers air at pressures from 14-16 ounces.

Two Stage Centrifugal Blower

¶ Delivers air at double the pressure of a single centrifugal fan with a blast wheel of the same diameter, run at the same speed.

¶ Blowers of practical proportions in this type, can be direct connected to large electric motors with efficient results.

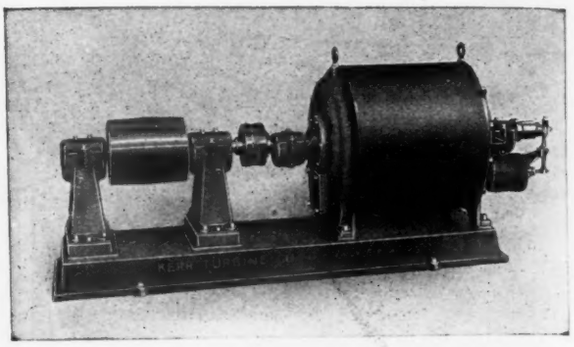
Write for particulars.

Buffalo Forge Co.

Buffalo, N. Y.

New York
Philadelphia
Pittsburg

Chicago
Cincinnati
Montreal, Can.



Yes, Kerr Turbines are Good for Belt Driving

Why not? Three of them are now running as well as ever in the plant of the Brooklyn Edison Company after three years of unusually severe service.

A belted Kerr Turbine would be more profitable than a belted engine in many plants.

Remember, a turbine is simple, compact, takes little floor space and foundation, requires less adjustment and lubrication and within its service limitations is in every way more satisfactory than a reciprocating unit.

GET OUR BULLETINS

KERR TURBINE CO.

STEAM KERR TURBINE

Wellsville, New York

Agents in all large cities

ON INLAND SEAS

YOUR VACATION TRIP

ALL the important ports on the Great Lakes are reached regularly by the excellent service of the D. & C. Lake Lines. The two large steamers of the fleet are fitted with steel construction and have all the qualities of speed safety and comfort.

The D & C Lines operate daily service between Detroit and Cleveland, and Detroit and Buffalo, four trips per week between Toledo, Detroit, Mackinac and way ports and two trips per week between Detroit, Bay City, Saginaw and way ports.

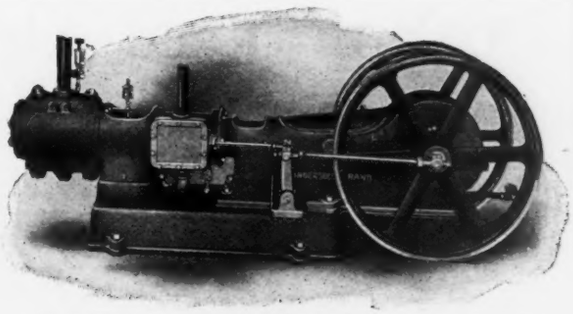
About June 25 a special steamer will leave Cleveland twice a week direct for Mackinac, stopping only at Detroit on every trip and Goderich, Ont., every other trip.

Send two-cent stamp for illustrated pamphlet and Great Lakes map.

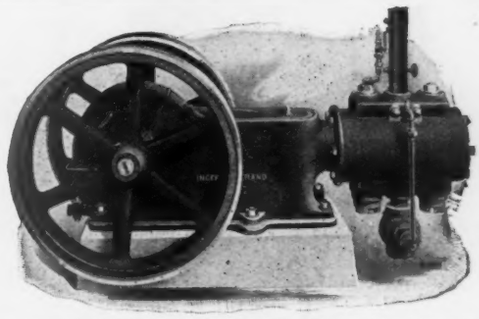
Rail Tickets available on steamer

Address L. G. LEWIS, G. P. A., Detroit, Mich.
P. H. McMILLAN, Pres. A. A. SCHANTZ, Gen. Mgr.

Detroit & Cleveland Nav. Co.



Class "NF-1" Dust-Proof Steam Driven Compressor
Bulletin 3009



Class "NE-1" Dust-Proof Power Driven Compressor
Bulletin 3110

"QUALITY MACHINES"
FOR THE FOUNDRY

The reputation of your product is determined by its "quality" as recognized by the trade you serve. A "quality product" is the result of using "quality machines" and "quality methods" in production.

Place **good machines** in the hands of **good men** and the result is sure to be an improvement in the quality of your output. **You cannot profitably make a good product with poor tools.**

We illustrate here a few of our machines and tools for the foundry—**"Quality Machines" every one, built for that class of men to whom quality is of greater importance than price.**

THESE ARE THE MACHINES YOU SAW IN OPERATION IN OUR EXHIBIT AT THE DETROIT CONVENTION.

They represent the very best of skill, experience and materials which we can put into them. In fact, we do not know how machines could be better built than these are.

They are built to satisfy you—the buyer and user, for your interests are our interests, and we will not hazard our standing with you by producing a "cheap" product.

Their design is the best that our thirty-nine years of building can produce. Their materials are the best obtainable, further improved by our special processes. Their workmanship cannot, we believe, be surpassed.

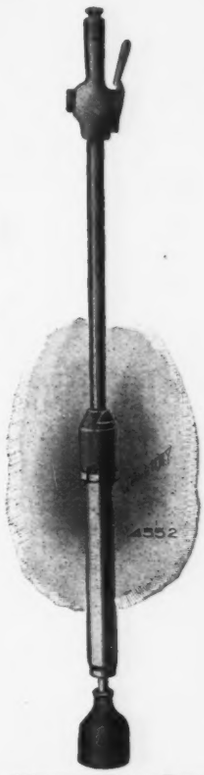
They are machines you can rely upon always. They will do all the work you can possibly expect or demand. They will use the least power consistent with the amount of work they do. They will "stay on the job" in a way to suit the most exacting.

They can be worked over-time. They can be pushed to the limit when speed is essential. **You will find them steady, dependable, money-making machines for hard service.**

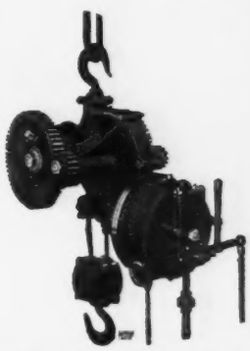
You can buy cheaper machines than these we offer you, but you cannot buy less expensive machines than these standard Ingersoll-Rand types.

The price you pay for them is exactly representative of the value they will bring to you as **profit-earning "quality machines."**

Write for the Bulletins designated by number under each illustration which interests you.



"Crown" Floor Rammer; also built as a Bench Rammer
Bulletin 8108



"Imperial" Vibrationless Air Motor Hoists
Bulletin 8006

"Crown" and "Imperial" Pneumatic Chipping Hammers and Drills
Bulletins 8003, 2010, 8004, 2007

INGERSOLL-RAND CO.

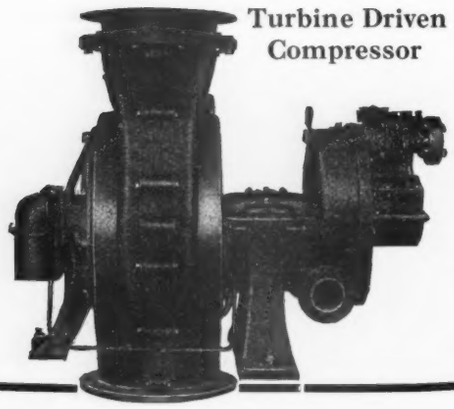
NEW YORK **LONDON**

DOMESTIC OFFICES

Birmingham, Boston, Butte, Chicago, Cleveland, Denver, Duluth, El Paso, Philadelphia, Pittsburg, St. Louis, Salt Lake, San Francisco, Seattle

FOREIGN OFFICES

Budapest, Dusseldorf, Johannesburg, Kobe, Melbourne, Mexico, Montreal, Paris, Valparaiso, Yokohama



Turbine Driven Compressor

Centrifugal Air Compressors

Motor or Turbine Driven

Particularly suited for foundry service because of their simplicity, durability, compactness, and low maintenance cost.

The power required to drive the compressor varies directly with the volume of air delivered.

Nothing to wear except bearings.

Full particulars on request.

General Electric Company

Largest Electrical Manufacturer in the World

Principal Office: Schenectady, N. Y.

Sales Offices in the following large cities:

Atlanta, Ga.	Denver, Colo.	Philadelphia, Pa.
Baltimore, Md.	Detroit, Mich.	Pittsburg, Pa.
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Butte, Mont.	Kansas City, Mo.	Salt Lake City, Utah
Charleston, W. Va.	Los Angeles, Cal.	San Francisco, Cal.
Charlotte, N. C.	Minneapolis, Minn.	St. Louis, Mo.
Chicago, Ill.	Nashville, Tenn.	Seattle, Wash.
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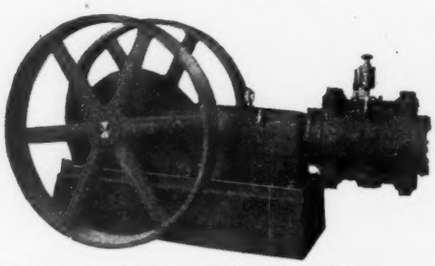
Cleveland, O.	New Orleans, La.	Syracuse, N. Y.
Columbus, O.	New York, N. Y.	

1970

Do You Need Air?



Sullivan Single Stage Belt Driven Compressor

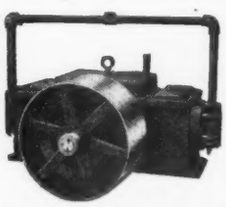
THERE IS A SULLIVAN Compressor of just the type and size to meet *your* working conditions most efficiently and economically. Sullivan Compressors unite the most approved features of modern design, with a conservatism in ratings, an honesty in materials, and a thoroughness in details of construction which enable users to place full confidence in them, for every-day service or for emergencies. *Ask for Catalogue 1858.*

Sullivan Machinery Co.

Railway Exchange

CHICAGO, U. S. A.

Birmingham, Ala.	Denver, Colo.	New York	Seattle
Butte, Mont.	El Paso	Pittsburg	Spokane
Claremont, N. H.	Joplin, Mo.	Salt Lake	St. Louis
Cobalt, Ont.	Knoxville	San Francisco	Rossland, B.C.



Comstock Air Compressors

PATENTED

Very Compact. Prices Reasonable.

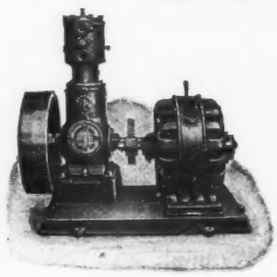
All moving parts enclosed and self-oiling. Especially suited for Foundries and other dusty places.

Belted and Motor Driven, 3 to 70 cu. feet.

59 NORTH MARKET STREET

GEO. S. COMSTOCK, Mechanicsburg, Pa.

Vertical HighSpeed Air Compressors



Cut shows Single Cylinder Connected to Motor

Especially Suited for Foundry Service

Enclosed, Self-Oiling, Renewable Bearings and High Efficiency

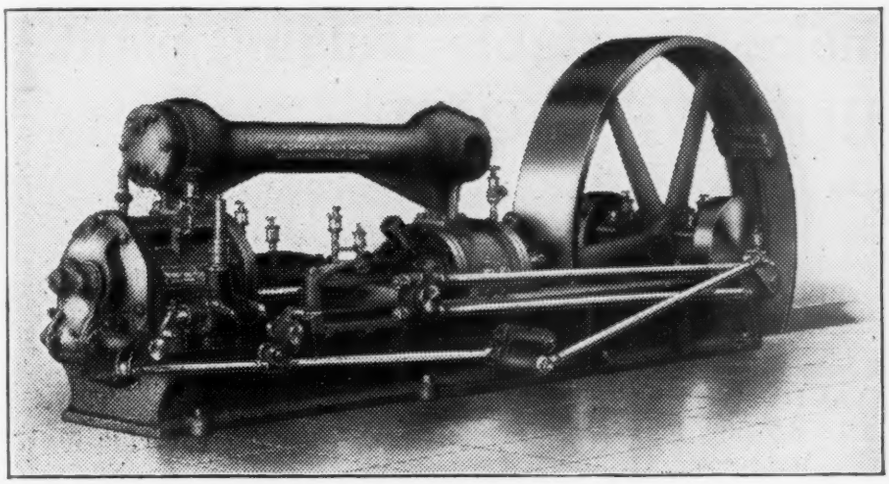
No Stuffing Boxes or Crossheads

Will Pump More Air Per Size of Cylinder than Any Other Machine

WRITE FOR INFORMATION

Gardner Governor & Foundry Co., Quincy, Ill.

Belt-Driven Air Compressors for Factory Uses.

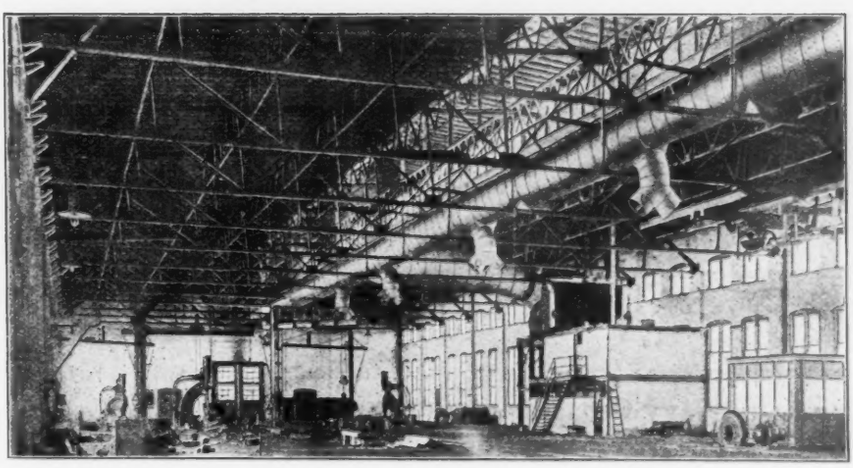


Constant Speed, Variable Capacity.
Automatic Regulation.
Can also be instantly cut out by hand.
No extra load or quick belt-breaking strain thrown on machine at moment of unloading or loading.

Inlet valves of Corliss form but without the limitations of ordinary Corliss valves.
Two pressures from the same machine, automatically distributed according to demand.
Many new features of great interest to Mechanics and Engineers.

THE NORWALK IRON WORKS COMPANY,
SOUTH NORWALK, CONN.

WITH THE Sturtevant SYSTEM OF HEATING AND VENTILATING



The apparatus is centralized and under one man's control.
There is no steam piping scattered around the building.
Consequently, no danger of freezing, or of damage from leaky joints, valves, or air-cocks.
The heater is especially adapted to the use of exhaust steam.
Heating can be accomplished with great rapidity.
Ample and positive ventilation is provided.
Building can be cooled and ventilated in summer.
The heating surface is enclosed in a fire-proof casing.
The air ducts are fire-proof.
There is no tendency to noise.
Operation is independent of wind or weather.

B. F. STURTEVANT CO., Boston, Mass.

429

We CAN place an Acetylene Generator on a Truck, to make a portable welding plant, BUT WE WON'T

YOU MAY BE WILLING TO TAKE SUCH A RISK, but **WE ARE NOT,** and we suspect your Insurance Companies will not. Better learn if they will give you the **REQUIRED** permit to make your policies valid.

Our **FIRST THOUGHT** in developing Oxy-Acetylene Apparatus was to **MAKE IT SAFE** and to **PROTECT** the **LIVES** and **PROPERTY** of our patrons. We spent many months in making it comply with the requirements of the Engineers for the National Board of Fire Underwriters, who are **EXPERTS IN GENERATOR CONSTRUCTION.**

Our principal stockholders have been manufacturing Acetylene Generators for many years, and are now operating the largest factory ever constructed, exclusively for this purpose. Our mechanism is more extensively used than any other anywhere. Even with such a highly developed Generator, we have too much regard for our reputation to place an **ACETYLENE GAS GENERATOR ON A TRUCK** for portable use.

If you are in doubt
ASK YOUR INSURANCE BROKER

Davis-Bournonville Co., 140 Cedar St., New York

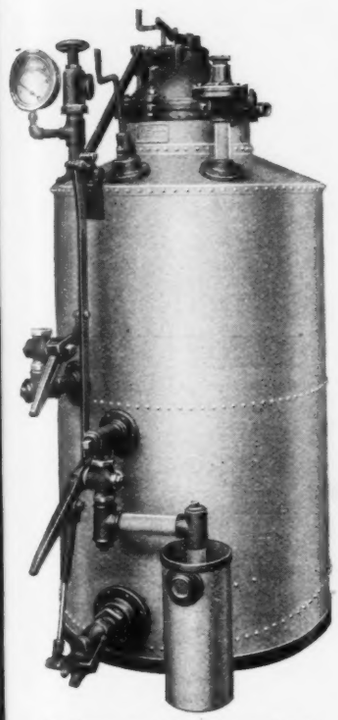
The Oxy-Acetylene Appliance Company

Singer Building, NEW YORK
Farmers' Bank Building, PITTSBURGH, PA.

Welding and Cutting Apparatus

Equipments of various sizes and types furnished to suit conditions
Used by the U. S. Navy Department and the largest industrial concerns in the United States

We will be pleased to give catalogue and any information desired upon request



Goodyear Acetylene Generator for both stationary and portable installation. Built of open hearth steel plates, galvanized after assembly. Steel castings and bronze bushings employed. Note the heavy construction.

Defective Castings of All Kinds Reclaimed and Turned Into Profit

Thousands of concerns the world over are doing just that with the Oxy-Acetylene Blow Pipe.

Defective castings, having blowholes, sand holes, cold shuts, or which are cracked or broken, are reclaimed. The castings may be either light or heavy, steel or iron (cast or wrought), or of bronze, aluminum or other metal. The cost of this reclaiming is generally ridiculously small.

The Secret

The Oxy-Acetylene flame gives the required heat and a temperature of 6500 deg. Fahr. The heat is controllable to any extent, according to the size of nozzle used. This jet of intense heat is played on the imperfect part. The surrounding metal melts down, becoming liquid. At the same time the jet is played against a stick or wire, generally of the same metal as the piece being treated. This also melts. The two run together becoming one. Thus the imperfections are filled up or a broken piece or part put on.

Wonderfully Simple

Knack in *handling* the heat, which is easily acquired, is the only requirement. *Control* of the heat is effected at the blow pipe. The metal is simply fused—runs, mingles. Due to the nature of combustion burning or oxidation is avoided.

Machined Castings Saved Too

Castings of all kinds developing flaws in machining are saved. Metal is fused into the imperfection as described. If an error is made in the machining itself it is corrected by fusing on metal. Holes drilled in error may be filled up and dressed down. Repairs of all kinds, utterly impossible in any other way, are accomplished.

Fusion Welding

Almost any product at present being riveted, brazed, soldered or otherwise made, may now be welded. The strength of such welding is 80 to over 100% of the metal, depending upon required conditions only. Values of application vary, of course, in different products, but in every case the product is bettered, competitors' goods outclassed and sales increased, so the direct result is bigger profit. In addition to the economic advantage production cost is often reduced enormously.

Goodyear Oxy-Acetylene Equipment

Is the result of over fifteen years' engineering experience in acetylene applications from flash lamps to town plants and government beacons and buoys.

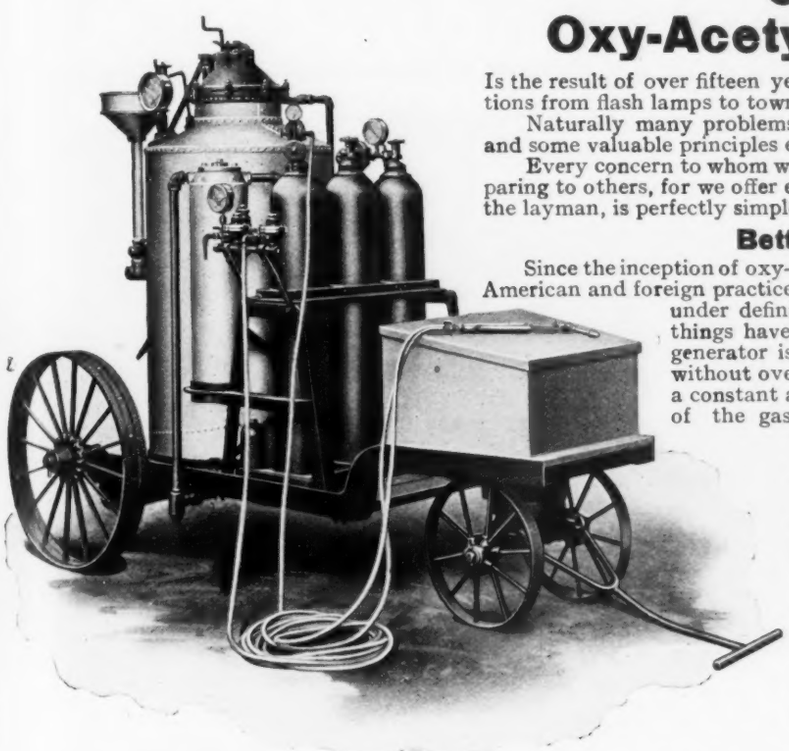
Naturally many problems encountered in oxy-acetylene have been solved and some valuable principles established—many not generally known.

Every concern to whom we have sold has bought our equipment after comparing to others, for we offer equipment of high efficiency, yet which, even to the layman, is perfectly simple.

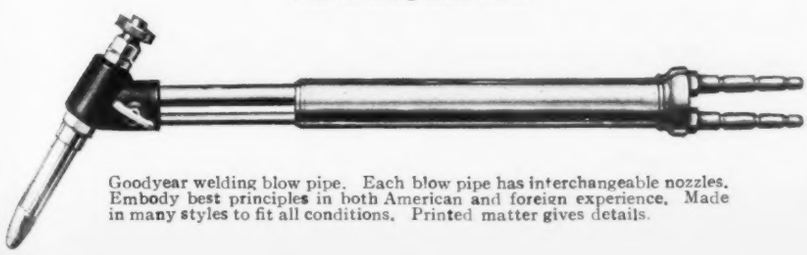
Better Than Foreign

Since the inception of oxy-acetylene we have exhaustively investigated both American and foreign practice. Thus we have developed complete equipment under definite data—unusually wide in its scope. Negative things have been both eliminated and avoided. Thus our generator is "positively" automatic, giving reliable service without over-production or waste. The generator maintains a constant and perfect balance between supply and demand of the gas and so uniform pressure is secured. The carbide feeding mechanism is simple, consisting essentially of but two parts. The carbide is fed in limited quantities into a relatively large body of water, giving cool generation. Neither the feed device proper, nor the carbide in the hopper, is exposed to the dampness or condensation within the generating chamber.

Due to the foregoing factors, Goodyear generators may be run under heavy overload on occasion, and will at all times deliver the gas clean, cool, pure and dry. These results cannot be accomplished, excepting by feeding carbide into water a little at a time. We guarantee our generators to function according to claims.



Portable plant complete. Built with broad wheel base and low center of gravity. Note the strong construction.



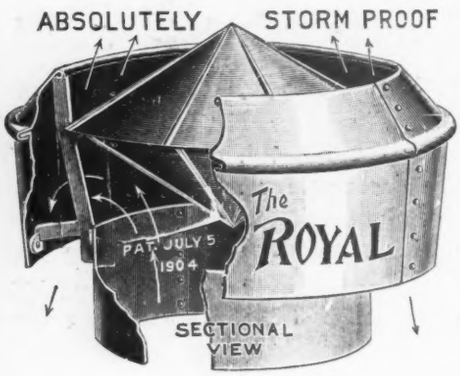
Goodyear welding blow pipe. Each blow pipe has interchangeable nozzles. Embody best principles in both American and foreign experience. Made in many styles to fit all conditions. Printed matter gives details.

Write Us

Printed matter going more into detail will be sent promptly. We furnish complete equipment—acytelene generator, oxygen and blowpipes to meet any need. Let us know the kind of work you are interested in.

Write us whether or not you have a welding plant, that we may send information covering our Back Pressure Valve, Blowpipes and Accessories, all of which we can show, we think, to be distinctly in advance of the art. Address:

Nelson Goodyear, Inc.
50 Church Street, New York City



When Quality Counts We Always Win!

Compare the old style ventilator with the NEW ROYAL DOUBLE CONE

The dotted lines and arrows show the **BAD ROUTE OF EXIT** in all Single Cone Ventilators

The dotted lines and arrows show the **BEST ROUTE OF EXIT** in the Royal Double Cone Ventilators

Royal Ventilators

are appreciated by owners. Tests prove them superior to all others. The Barrett Manufacturing Co., Peoria, Ill., largest manufacturers of roofing and felts in the country, are now using **11.54 inch** and **21.48 inch** "Royal" on their new buildings. Selected in preference to all others.

Our business has been built up by satisfied architects and patrons. Our business is manufacturing **"ROYAL" VENTILATORS** only, not as a side line, but as a business, and it is fair to presume we can give you *better ventilators* for the same money and at the same time give you the neatest and most efficient ventilator made. We can cite many instances when the **ROYAL** was selected solely on account of merit in place of other ventilators that had been specified. We seek a chance to prove our case.

If you are in doubt what you should use for your Foundry, Factories, Barns, Stables, and homes, and the cost, write to us for our 80 Page Red Booklet. It will be a pleasure to send it without cost to you.

Royal Ventilator Co. Main Office and Factory 418 Locust Street **Philadelphia, Pa.**

ECONOMY EXPENSE

WHICH?

LUXURY INCONVENIENCE

Saving Money—or Burning It!

Are you buying **barrels** or just staves and hoops? Here is the difference: Our STEEL SHOP BARREL will last for years, and you can **never** reduce it to staves and hoops; but, try as you may, you **cannot** prevent a wooden barrel from collapsing in a **very** short time.

Invest $100.00 in STEEL SHOP BARRELS and at the end of THREE or FOUR YEARS your barrels will still be giving you service.

Invest $200.00 in Wooden Barrels and what have you left at the end of ONE YEAR? **NOTHING!**

Are you going to burn your money—or SAVE IT?

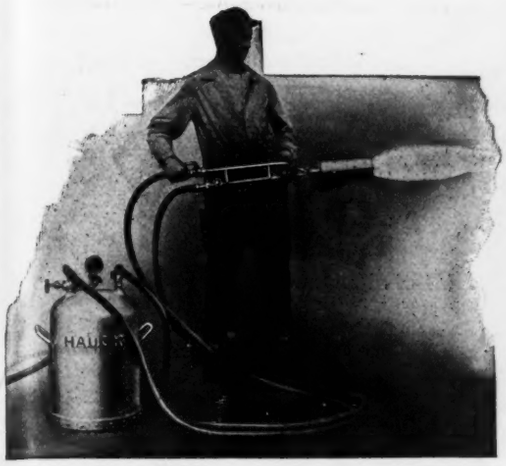
STEEL SHOP BARRELS require much less space than wooden barrels, are easier to handle, and require no time for changing or repairing.

THE CLEVELAND WIRE SPRING CO.

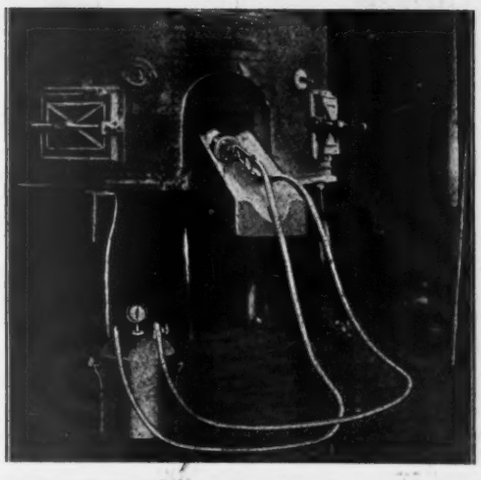
CLEVELAND, OHIO

Western Office 40 DEARBORN STREET CHICAGO, ILL.

STEEL SHOP BARRELS are economical in every way. INVESTIGATE THEM! Write for "Things Your Factory Needs" and find out about other **Money Savers** we make.



HAUCK PATENT FOUNDRY OIL BURNERS



"HAUCK" BURNERS will reduce your expenses, save TIME and LABOR, and keep your foundry free from smoke and ashes.

They are used to great advantage for

Firing up Cupolas without Wood
Skin Drying Molds
Drying and Heating Ladles
Brazing, etc.

Hauck Burners are operated **in over 2,100** foundries, with all grades of fuel, crude or kerosene oil.

Hauck Manufacturing Co.

MAIN OFFICE
Richards St. and Hamilton Ave., Brooklyn, N. Y.

POWER SPRUE CUTTER No. 102

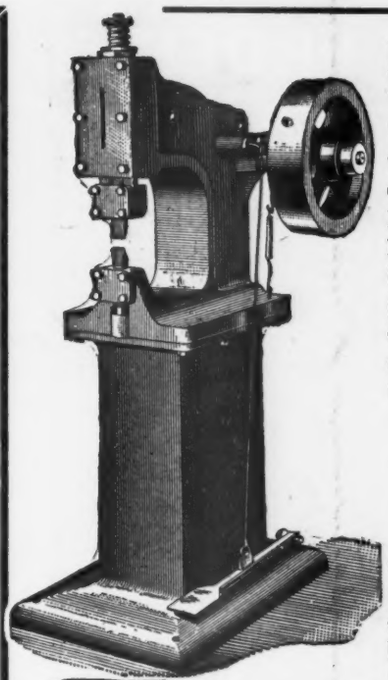
All Working Parts Dust Proof

This cut illustrates our Power Sprue Cutter which is a strong Powerful tool, great care having been taken to insure sufficient strength to cut off any reasonable amount of metal. The throat is large and gives ample space for large and difficult castings. The fly wheel and connecting rod are bronzed bushed the crank shaft is of forged steel and has good long bearings with ample means for lubrication. All working parts are covered and dust proof, insuring long life to slide. Provision is made for adjusting the cutters so that wear can be taken up. The machine is operated by pressing treadle with the foot or can be worked continuously by throwing in the latch.

This Sprue Cutter is strong and heavy and at the rated speed works up to the capacity given or its equivalent smoothly and easily.

TURNER MACHINE CO.

3632-4 N. Lawrence Street, Philadelphia, Pa.



Don't Hesitate

to invest in whatever saves labor. Every blow of the hammer on the chisel in the old chip, chipping away way of cutting gates from castings trims down the margin of profit.

A Shuster Power or Foot Lever Sprue Cutter

operated by one man will do more than a dozen men can in the hammer and chisel way and the castings will be trimmed cleaner and closer.

We make a specialty of building automatic labor saving machinery.

Catalogue for the asking.

F. B. Shuster Company

Formerly John Adt & Son.
New Haven, Conn.

Calumet Engineering Works

Harvey, Ill.

DESIGNERS AND BUILDERS OF

CRANES
LADLES
CUPOLAS

COMPLETE FOUNDRY EQUIPMENT

Meet us at the Detroit Convention.

GREATER PROFITS

IF WE PROVE TO YOU HOW YOU CAN SAVE MONEY

WILL YOU DO IT?

Your business may be paying well, but we can increase your profits.

Our **Skimming Tank** will do the trick, and our circular "000" will tell you how.

Better write us and get 50 to 200% more out of your skimming pile than ever before.

METAL DROSS ECONOMY CO.
BRISTOL, CONN., U. S. A.

? *Wouldn't You Now Wouldn't You--*

Have given $2.00 many a time to know just how to insure an Economical Production of Castings of any desired character. Settle the matter now by inclosing remittance and writing your name and address here—

_____

_____

and we will send immediately a copy of

Crobaugh's Methods of Chemical Analysis and Foundry Chemistry

A practical work by an expert practical foundryman, on Sampling and Preparation of Samples—Moisture Determination—Coke and Coal—Figuring Mixtures—White, Chilled, Malleable, Machinery, Gray Iron and Annealing Castings—Car Wheels—Chilled Rolls, etc., etc.

Now Revised and Enlarged Edition. Cloth, Postpaid, $2.00

Book Department
The Penton Publishing Co.
Cleveland

The conflagration of April 13, 1909, at Rochester, N. Y., spread via the roof line (for views of the ruins in different sections of the city, see pages 433 to 439). Fire-resistive roofs would have prevented this fire from getting a hold on buildings far from where the firemen were trying to extinguish the flames. A roof that will confine a fire to the building in which it starts will also keep out an "exposure" fire. The safety of cities from conflagrations involves the passing and enforcing of laws that prohibit wooden roofs.

Prevents Conflagrations

Here is a clipping from "Insurance Engineering" confirming the opinion of other high authorities---that conflagrations can be prevented by roofing buildings with a fire-resisting roofing, so that flying embers will not cause fires to spread.

J-M Asbestos Roofing

cannot be set on fire by burning sparks, embers, etc., because it is made of *Asbestos*. It will resist the flames of a blow torch for 50 minutes without being burned or injured. It is a *positive fire protection*.

J-M Asbestos Roofing is also rot-proof, rust-proof, acid-proof, heat-proof and cold-proof. It never needs painting.

Write nearest branch for Sample and Catalog 303---or simply write your name and address on the margin of this advertisement and mail it to us.

H. W. JOHNS-MANVILLE CO.

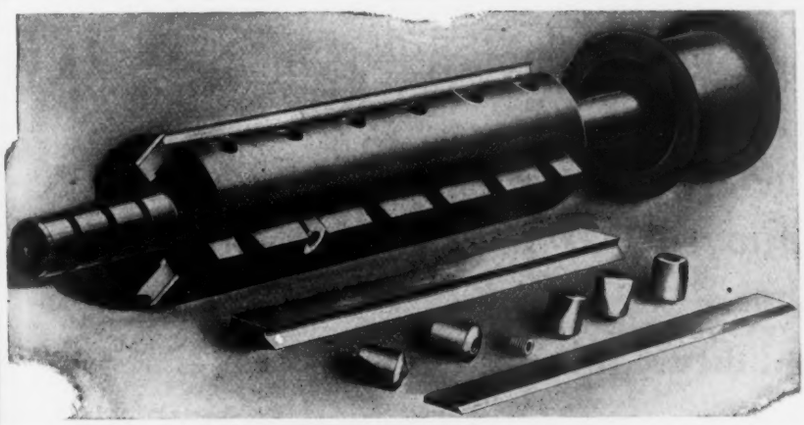
Manufacturers of Asbestos and Magnesia Products.

ASBESTOS

Asbestos Roofings, Packings, Electrical Supplies, Etc.

Baltimore	Cleveland	London	New Orleans	San Francisco
Boston	Dallas	Los Angeles	New York	Seattle
Buffalo	Detroit	Milwaukee	Philadelphia	St. Louis
Chicago	Kansas City	Minneapolis	Pittsburg	

In this test the flame of a powerful blow-torch was placed within two inches of J-M ASBESTOS ROOFING. At the end of fifty minutes the roofing was not burned or injured, being only slightly blackened with smoke.



Protect your Fingers

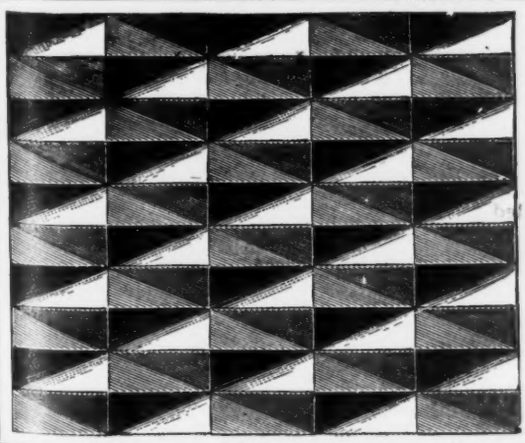
by using a CRESCENT Jointer with safety head

The knives in CRESCENT safety heads are made of high speed steel which will hold an edge longer and turn out better finished and more work than can be done on a common jointer with ordinary knives. You may crowd the machine to the limit and the quality of work will be just the same as though you hadn't crowded it a bit.

The price of these splendid machines is very reasonable considering the very high quality of the machines and the enormous amount of accurate work they are capable of turning out.

Send for catalog giving complete description. It tells about our elegant line of Band Saws, Saw Tables, Jointers, Borers, Shapers, Planers, Planer and Matchers, Pole-Rounders, Disc Grinders, Variety Wood-Workers.

THE CRESCENT MACHINE CO.
51 Columbia St. Leetonia, Ohio, U.S.A.



Diamond Pattern Lumber

This material is made by a Special Machine, invented by us (the only machine of its kind), and each piece will match *perfectly* with all other pieces by "jointing" the edges to the center, lengthwise, of any row of Diamonds.

Size of Each Piece—Eight feet long by six inches wide and one-half inch thick.

Write for Prices and Sample

BROWN BROS. MFG. CO.
22d and Campbell Ave., CHICAGO, ILL.

If you want to reach all the people who buy Foundry Equipment and Supplies there is just one best way---THE FOUNDRY.

THE FOUNDRY goes to more men in charge of foundries than any other paper in the world.

It is in a class by itself.

You cannot buy its circulation elsewhere; you cannot reach its readers any other way than through its advertising columns.

Its rates per thousand circulation are far lower than any other publication in the foundry field.

And, by the way, there is just one rate for everybody---no special bargains---no free space propositions.

There is quality and quantity in THE FOUNDRY'S circulation---unequalled anywhere on earth in the trade it covers.

There is really nothing with which to compare THE FOUNDRY.

THE FOUNDRY is *the first* in its field.

It carries the advertisements of practically all who are engaged in foundry supply trade.

It carries also the greatest prestige of any journal in its class, and this is a point that is most valued by experienced advertisers.

Some advertisers seem to think that a page is a page, and the page that costs the least is the one to buy.

But it isn't the page---it's the *man* or *men who read it that sets its value*---for without the right kind of readers the page would be worthless.

THE FOUNDRY is subscribed for and read by over 90 per cent of the foundry proprietors, superintendents and foremen in America, and an advertisement in this paper will bring your product before these men better than anything else printed.

DETROIT CORE SAND

A GOOD thing to know ---and where known is acknowledged superior for cores and all castings--- Aluminum, Brass, Iron, etc. It has more than ordinary merit.

The excellent results produced by Detroit Core Sand have given it preference in the largest foundries in this section. Moulders demand it for core work. To the foundryman seeking to produce better cores and smoother, cleaner castings we recommend Detroit Core Sand. You'll be satisfied--- that we know, for its value is very apparent.

The Detroit Core Sand Co.

DETROIT, - MICH.

OSCAR BARNETT <STANDARD>

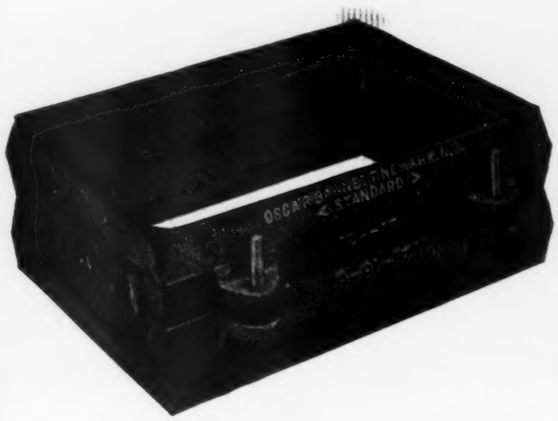
THE NAME HAS STOOD FOR

1845 **FOR 65 YEARS** 1910

HIGH GRADE IRON FLASKS

Look for the Name

The Hall Mark of Quality



Not blown in the glass but cast on the flask

Every Style for all Purposes.

Brass Foundries Equipped Complete.

Ask us first.

Founded 1845

OSCAR BARNETT FOUNDRY CO.

NEWARK, N.J.

Style "A"

Style "B"

Style "E"

Style "G"

Style "H"

Style "K"

Have You One Of Our New Catalogues?

If Not--- Why Not?

Style "F"

Have You Ever Tried Out Sterling Flasks?

If Not--- Why Not?

STERLING SPECIAL ROLLED STEEL FLASKS LEAD THE PROCESSION

"A" REVOLUTION IN MODERN FOUNDRY PRACTICE.
"B" ROUGHT ABOUT BY STERLING SPECIAL ROLLED STEEL FLASKS.
"E" CONOMY, STRENGTH, DURABILITY, LIGHTNESS AND EFFICIENCY.
"G" ROWING DEMAND AND REPEAT ORDERS FROM ALL USERS.
"H" AVE PROVEN A POSITIVE AND UNQUALIFIED SUCCESS.
"K" EEP UP WITH THE PROCESSION AND PLACE YOUR ORDER FOR
"F" LASKS THAT WON'T BURN, BREAK, WARP OR CORRODE.

STERLING WHEELBARROW COMPANY

WEST ALLIS, WISCONSIN

ESTABLISHED 1879 *F. E. GORDON, Pres.*

MINERS OF THE BEST GRADES OF

MOLDING SAND

THE OHIO SAND CO.

MAIN OFFICE

CONNEAUT, OHIO

Our Sand is second to none *A request brings Samples and Prices*

MECHANICALLY PREPARED

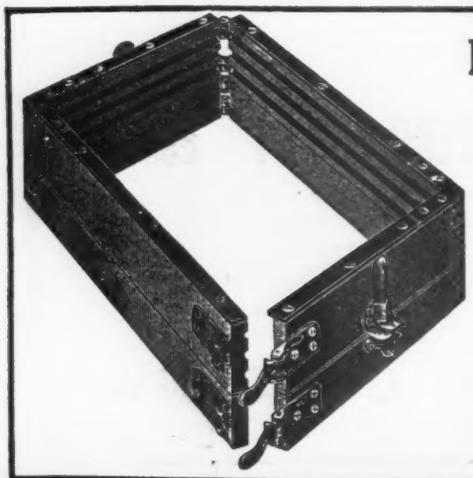
TUSCORA

High Grade Molding Sands

ALL SHIPMENTS UNIFORM QUALITY

TUSCORA SAND COMPANY
WILLIAMSON BUILDING
CLEVELAND, O.

APPLY FOR SAMPLES AND PRICES



NEW EUREKA SNAP FLASK

MACHINE LOCK CORNERS
ALL MALLEABLE TRIMMINGS MADE IN RED OAK

QUICK DELIVERIES

TWO PART FLASKS

Any size up to and including 12 x 18 - - -	$3.25 each
Any size over 12 x 18 up to and including 15 x 20	3.50 "
Any size larger than 15 x 20 - - - - -	4.00 "

SMITH & CAFFREY COMPANY

Successors to C. H. GREEN & CO.
SYRACUSE, N. Y., U. S. A.

B. T. & B.

STEEL FLASK OUTFIT

SEND FOR OUR NEW 32-PAGE FLASK CATALOG

The B. T. & B. Flask has no equal for Bench or Machine Work. It is rapid and accurate and is guaranteed to **save time, money and worry.**

It is the only All-Steel Taper Flask made, and all foundry operators, superintendents, foremen and moulders should write us for particulars and learn of the many distinctive advantages of the "B. T. & B."

Its rapidity and accuracy put it far in advance of anything else of its kind on the market. Each flask is supplied with six jackets.

Write us for further information.

BALDWIN, TUTHILL & BOLTON

Manufacturers of Woodworking Machinery

6th and 7th Sts., GRAND RAPIDS, MICH.

The Newport Sand Bank Co.

Newport, Ky., U. S. A.

Producers and Shippers of High Grade

MOLDING SAND

We handle all different grades. Supply unlimited. Prompt Shipments. Now is the time to lay in winter supply. Samples and prices on request.

The Milwaukee Snap Flask

PATENTED

The Pins and Plates of this flask are made to assure an even l if and can be adjusted at any time to secure a perfect fit. Shrinkage of the flask is positively prevented by the Locking Device.

The Wood used in its construction is either Maple, Ash, Oak or Cherry.

The trimmings are of Malleable Iron, the Edge, Top and Bottom are made of Steel, the corner Irons have Ears on for the purpose of strengthening the Corner Plates, being screwed on Inside and Outside of the flask.

The Milwaukee Snap Flask is the strongest, most durable, will stand the hardest usage and gives the best satisfaction of any snap flask in the market today.

Will outwear 3 to 5 of the ordinary snap flasks.

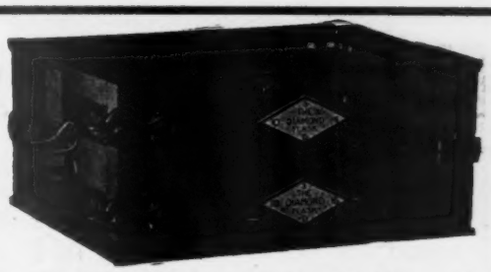
Manufactured by the

Chas. Jurack Pattern and Foundry Supply Mfg. Co.

269 Clinton St., Milwaukee, Wis.

The Diamond Snap Flask

——The molder's favorite because it's the lightest and most durable flask on the market, made of Michigan Maple air seasoned, all malleable trimmings, mortised and put together with bolts. Mitered corners with angle Irons. We are pioneers in the snap flask manufacture, established in 1889. Send for our telegraph cipher code, where you can order three (3) flasks, giving depths and dimensions in ten (10) words. Compare the weight of our flasks with others. Sizes and Trade Mark stamped on each flask.



Send for our catalogs of Core Machines and Pattern Shop Equipments and Supplies. We make core machines to make any kind of a core.

DIAMOND CLAMP & FLASK CO., Richmond, Indiana, U. S. A.

ZANESVILLE

HIGH GRADE MOLDING SANDS

THE INTERSTATE SAND CO.

Why not use the BEST—that's INTERSTATE

ZANESVILLE, OHIO

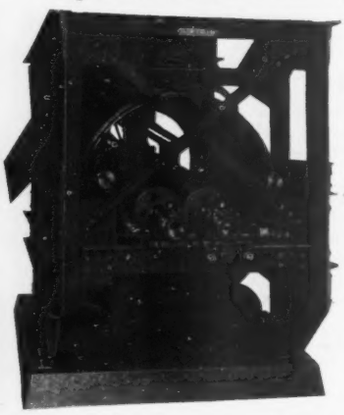
Request Brings Samples and Prices

THE BEST GRADES

MOLDING SAND

FOR ALL PURPOSES

Attention is called to the fact that WE SUPPLY PROMPTLY all requirements of the trade for HIGH GRADE MOLDING SAND



Our Sands will reduce *to the minimum* the cost of making your castings.

With a capacity of 25 cars a day, four latest improved sand mills, **18 grades of Molding and Core Sands,** and *thirty years* of experience, we are in a position to facilitate and economize your foundry problem to the greatest extent.

For preparing Core, Facing and Floor Sands for all foundries. A saving of about 75% of power and labor. Besides, there is no comparison in results over other methods.

The operations of machine are as follows:

1st.—The automatic proportioning of three different kinds of materials to be mixed.
2d.—The screening of the material delivered by the elevator.
3d.—An automatic mixing and tempering machine to mix and temper the sand.
4th —The rolling, crushing and blending of the material.

Advise kind of castings you are making, and we will mail you samples of our sand.

Now is the time to send us your order. Ask for Catalog No. 5.

The Standard Sand & Machine Co., Cleveland, O.

Niagara Parting

Sold Strictly on Approval
Let us send you a free Sample

MOULDING SAND, FIRE CLAY, SOAPSTONE, SILICA WASH, CRUCIBLES, PLUMBAGO, ETC.

We carry in stock a full line of Foundry Facings and Supplies. Some of our specialties: "Lion Brands" Core Wash and Compound, Foundry Flour, Molasses, Rosin, Core Oil, Iron Cement, Sea Coal, Fluor Spar, Etc., Etc.

KEYSTONE FOUNDRY SUPPLY CO.

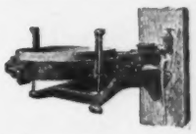
Warehouses: Buffalo, N. Y. Cincinnati, O

437 to 443 Ellicott Square, Buffalo, N. Y.

SWIVEL POST

HANNA SHAKERS

THE STAR ATTRACTION
AT THE
FOUNDRYMEN'S CONVENTION



STATIONARY POST

FOR
MOLDING MACHINE
OR
BENCH WORK

SIMPLE IN DESIGN
SUBSTANTIALLY CONSTRUCTED
POWERFUL ACTION

DON'T
RIDDLE YOUR SAND
BY HAND

MACHINES
FOR ALL KINDS
RIDDLING OR SEPARATING

PLACE YOUR
ORDERS NOW

THE ONLY
WORKING SAND SIFTER
AT THE SHOW

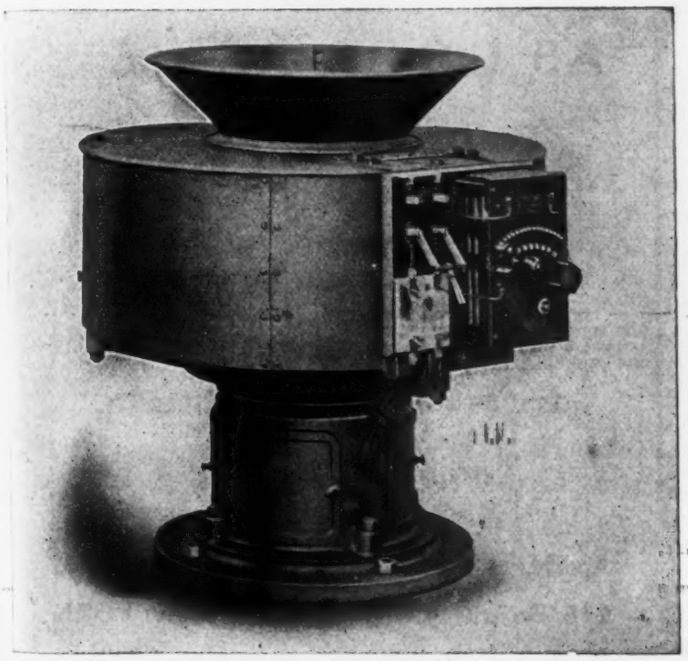
"THE BEST INVESTMENT FOR ANY FOUNDRY." "WILL PAY FOR THEMSELVES IN A MONTH'S TIME."
WERE COMMON EXPRESSIONS FROM HUNDREDS

REVOLVING
DUMPING RIDDLE

HANNA ENGINEERING WORKS 2075 ELSTON AVENUE CHICAGO, ILL.

William Sellers & Co., Incorp. Philadelphia, Pa.

LABOR SAVING MACHINE TOOLS

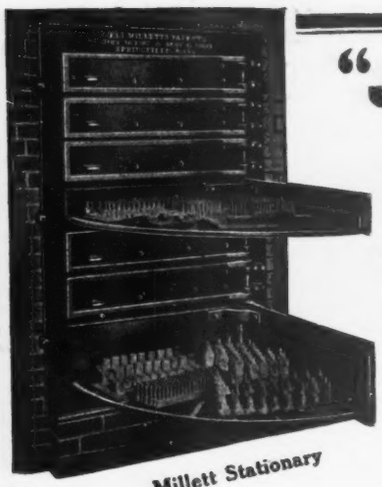


Our Centrifugal Sand Mixing Machine, belt or motor driven, will disintegrate lumpy sand, and will thoroughly, evenly and quickly mix all kinds of molding sand, core sand and foundry mixtures. This treatment strengthens the sand and increases its porosity.

The actual capacity of the machine is limited only by the facility with which the sand can be delivered to and removed from it.

Our Part Catalogue No. 1800 contains full particulars, and we shall be pleased to send copies to interested parties.

CRANES, SHAFTING, TURNTABLES, INJECTORS, ETC.



Millett Stationary

"Just What You Need"

THE MODERN CORE OVEN

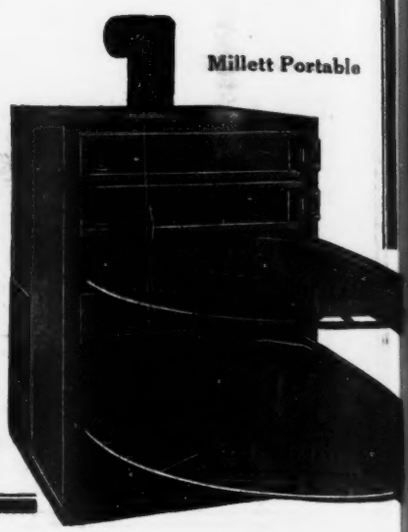
The Millett Core Oven works continuously. There is no interruption and cores are dried in less than half the usual time.

With the old styles of core ovens you make cores one day and do not receive them until the next morning.

With a MILLETT OVEN you can secure a perfectly dried core of average size in a couple of hours' time. Just think what this means when a hurry up job comes along!

MILLETT PATENT CORE OVENS

It's up to you to say whether you want to continue worrying along with your old core oven and its delays or whether you want the MILLETT, which does its work right and gives you cores on the spot. Ask for further particulars about the MILLETT CORE OVEN—the only core oven to get a silver medal at the St. Louis exposition.



Millett Portable

Millett Core Oven Co.,
SPRINGFIELD, MASS.

Climax Core-Wire Straighteners

MAKE OLD MATERIAL AS GOOD AS NEW

Much material often thrown away can be saved and core-makers' time can be saved by a machine which straightens $\frac{1}{4}$", $\frac{3}{8}$", $\frac{1}{2}$", $\frac{5}{8}$" and $\frac{3}{4}$" wires as fast as a boy can feed them in.

Write for Bulletin F-820

WORKS:
East Cambridge, Mass.

Geo. F. Blake Mfg. Co.
115 Broadway, - NEW YORK

176

Did you see our exhibit, at the Detroit Convention, of cores made with our Core Oil, by the leading Detroit manufacturers?

THE TRUE FACTS

Our CORE OIL is the strongest BINDER on the market, and our prices the lowest.

Our CORE OIL will make any core that Linseed Oil will, and equally as good.

We employ practical men, who will demonstrate this to you in your foundry if you will kindly give us the opportunity.

Write for prices and full information.

T. J. PETERSON CO.

Largest Manufacturers of High-Grade Core Oils

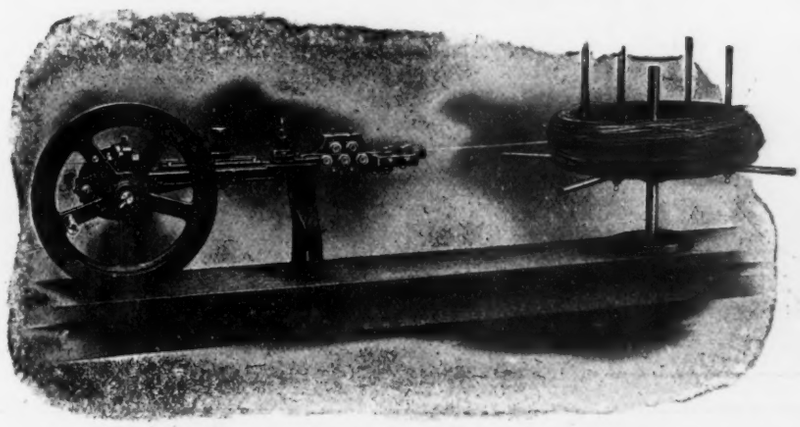
GENERAL OFFICES:
Sixth Floor Security Bldg., CHICAGO

Remember that the name PETERSON stands for uniform quality on Core Oil

BRANCH OFFICES:
T. J. PETERSON CO.
82 Beaver Street
NEW YORK, N. Y.
T. J. PETERSON CO.
378 Ellicott Square
BUFFALO, N. Y.

Direct Representatives:
A. B. ELWES
DETROIT, MICH.
JOS. HARRISON
MILWAUKEE, WIS.
G. B. OGAN
ST. LOUIS, MO.

Gregg Core Wire Cutting Machine No. 7



This machine is to cut core wires from an inch long up to 12 inches, of any kind of wire up to 1-8 inch in diameter. The operation is simple and direct--no parts to wear out or get out of order.

The operations are so quick, that a boy can cut in a half hour as many core wires as it required two boys a whole day by the old method. Each wire is measured automatically. The wire straightener is a part of the machine and can be adjusted to meet any size of stock.

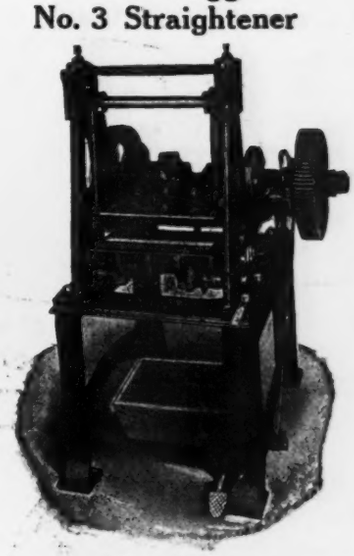
It is the only machine made that will straighten, cut to length and handle core wires rapidly and cleanly.

The Gregg Manufacturing Co.
1318 W. 4th St., Cleveland, Ohio

THOMAS W. PANGBORN COMPANY
NEW YORK
Exclusive Eastern Sales Representative

THE J. D. SMITH FOUNDRY SUPPLY CO. Cleveland, Ohio
THE S. H. BRAND CO. Chicago, Ill.
DETROIT FOUNDRY SUPPLY CO Detroit, Mich. Windsor, Ont.
THE HILL & GRIFFITHS CO. Cincinnati, Ohio Birmingham, Ala.
HENRY H. DONALD SALES CO. Milwaukee, Wis.

The Gregg No. 3 Straightener



Don't Throw Away Your Old Core Wire

Straighten it on The Gregg Mfg. Co.'s No. 3 straightener.

It straightens wire as fast as it can be fed into the machine.

It does not require adjusting for different sizes and lengths of wire.

It does as much work in one hour as a boy will do in ten hours.

It saves buying new wire.

The old wire can be used several times.

It pays for itself in a few months.

A new and valuable addition to foundry equipment.

Write for special circular.

1/3 THE COST - SAME WORK

The **double-head, gray iron Chaplets** will do the same work as any wrought iron chaplets on the market, and cost only **one-third as much.**

These chaplets have an excellent bearing surface, and the stems are rougher than wrought iron chaplets, causing the hot iron to grip them more readily.

They will fuse into hot iron, thus avoiding "blow-holes". In hot or cold water castings they will rust in, as they are not tinned.

We also manufacture **nail pattern plates** from which any molder or handyman can make 3 000 or 5,000 nails a day. You will find that cast iron nails **are cheaper, grip better, fuse better, break off cleaner** and are the **best remedy for porous spots.**

Don't fail to write for further information and prices.

The Rochester Foundry Co.

330 Lyell Avenue, ROCHESTER, N. Y.

Kingsland's Iron Killer Destroys Iron in Brass

Kingsland's Iron Killer Destroys Iron in Brass

"THE MAN WITH THE UMBRELLA"

Combined Foundry Supply Co.

J. S. KINGSLAND & CO., Proprietors

Don't You Want Brass or Galvanized Riddles

Riddles Stongly Made. Rims That Won't Come Off.

Cloth 19 Inches Wide. Makes Full Size Riddles Heavy Wire.

766, 768, 770, 772 Grant Street, BUFFALO, N. Y.

WAX-WIRE.

Registered Trade Mark.

A Perfect Core Vent is an Insurance against Loss from Unsound Castings

Leaves the vent hole clear and clean
Is perfectly flexible under all temperatures
It melts readily and evaporates quickly
Costs about 5c per 100 lineal foot and upwards, according to size.

Samples free on application

ALFRED FIELD & COMPANY

93 Chambers St., NEW YORK

Vent your cores with a good Vent Wax to insure good castings

BUFFALO BRAND

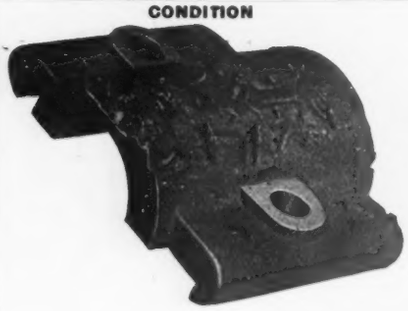
Vent Wax makes a good vent and will not injure any core.

Write us for circulars.

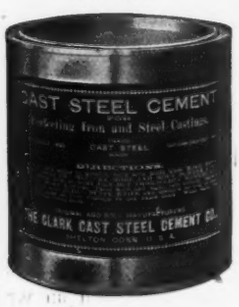
UNITED COMPOUND CO.

178 Ohio Street BUFFALO, N. Y.

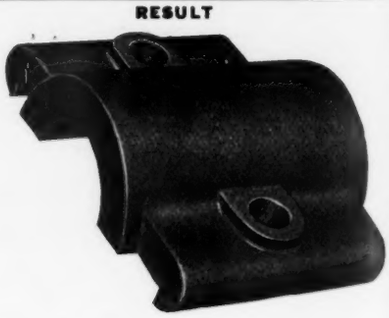
CONDITION



REMEDY



RESULT



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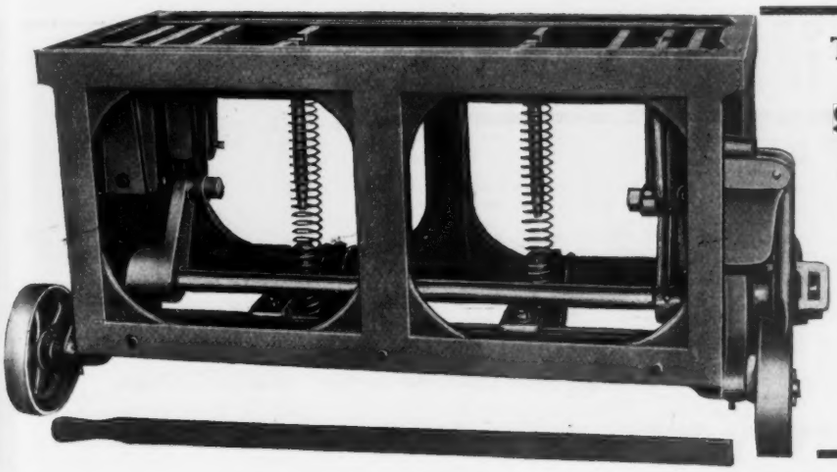
MANUFACTURERS
THE CLARK CAST STEEL CEMENT CO.
SHELTON, CONN., U. S. A.

AGENTS: Whitehead Bros. Co., New York City.
J. W. Jackman & Co., Ltd., London, S. W., England.
R. T. Oglesby, 34 South Clark Street, Chicago, Illinois.
J. W. Plant, 1054 Monadnock Building, San Francisco, Calif



TYPE C. L. OPEN FRAME
Portable or Stationary
SIMPLEX MOLDING MACHINE

Draw 6 to 12". Height 20 to 22". Double shaft on all sizes over 22 inches wide. Adjustable brass guides. Send for our latest catalogue.

ROWLANDS MACHINE CO.
Racine Junction, WIS.

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Mr. Foundryman. You get prompt, quick delivery of

Piqua Flour

Complete stock carried by the following well-known firms:

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N. Y. Sand & Facing Co.,	Brooklyn, N. Y.
J. S. McCormick Co.,	Pittsburg, Pa.
Pettinos Bros.,	Philadelphia and Bethlehem, Pa.
J. D. Smith Foundry Supply Co.,	Cleveland, Ohio
David Trubee & Co.,	Bridgeport, Conn.
Whitehead Bros.,	New York and Providence, R. I.

Piqua Flour Company, Piqua, Ohio

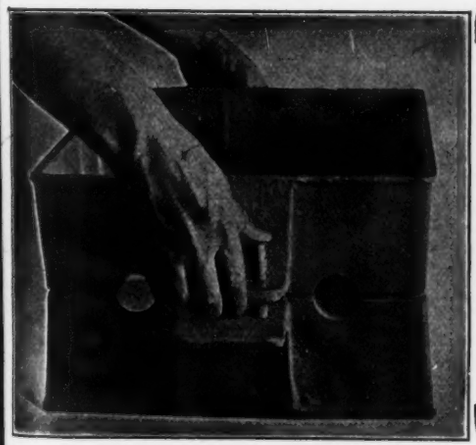
LIN-O-CORE OIL

"Lin-O-Core" builds a good venting core.
"Lin-O-Core" holds a sharp edge to the core.
"Lin-O-Core" makes a core easy to remove from the iron.
"Lin-O-Core" is as practical to use as Linseed Oil.
"Lin-O-Core" costs much less than Linseed Oil.
"Lin-O-Core" is used by the largest foundries.
"Lin-O-Core" is always the same in quality.

State the kind of sand you use and the kind of castings you make, and let us quote prices or send a sample barrel.

We Also Manufacture Machinery Paint, Iron Filler, Japans, Building Paints, Linseed Oil, Etc.

THOMPSON & CO.
Diamond Linseed Oil and Paint Works
ESTABLISHED 1847 ALLEGHENY, PA.



Brass Founders Supply Co.,
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All Kinds
of machine flasks that fit.
Get Catalog No. 14

Colonial Solid Back Casting Brush

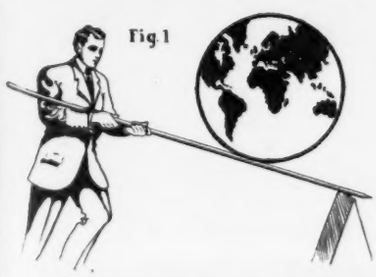
Made of flat tempered steel wire. You'll never use another after you have tried our **solid back** brushes. Unsurpassed for **strength** and **durability**. **Do not split or come off**, as is frequently the case where two-piece blocks are used.

Write for prices, etc.

COLONIAL BRUSH & MFG. CO.
348-54 Florida St. MILWAUKEE, WIS.

A New Roll Over Molding Machine

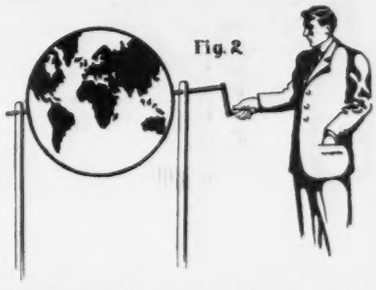
Its Principles are as Shown in Figure 2



WHICH IS LOGICAL?
WHICH IS EASIER?

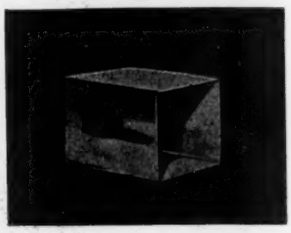
Waste effort = Reduced production.
Reduced production = Lost profit.
Therefore: Waste effort = Lost profit.

Are you interested:—If so write for full information and trial offer.



THE MIDLAND MACHINE CO., 60 Woodbridge St., Detroit, Mich.

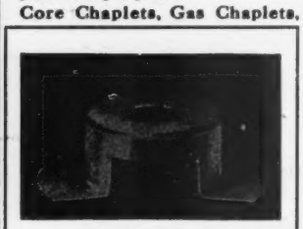
BURDICK'S PATENTED SHEET METAL FORMS



CHAPLETS

BURDICK CHAPLETS have been used by foundrymen for years. They insure a smooth surface, a tight union, and a uniform thickness of metal. We make them in every size, and for every possible purpose.

Core Chaplets, Gas Chaplets, Double Loop, Curved or Pipe, Box, Perforated, etc.



BURDICK'S PATENTED SHEET METAL FORMS that we manufacture for all purposes require no machinery—that means a great economy

BURDICK & SON, ALBANY NEW YORK

SMALL SPECIAL SHEET METAL STAMPINGS A SPECIALTY

Originators of the Kalamazoo System of Aluminum Matchplate Molding

Just Supposin'

You KNEW YOU could save big money by adopting the Kalamazoo System of Matchplate Molding;

You KNEW WE could save **YOU** money in equipping your foundry with matchplates;

You KNEW that we have the most perfect roll-up hinge and flexible guide, *all our own;*

You KNEW that our workmanship was absolutely the best;

You KNEW that we guaranteed every plate we make to work in the sand,

You'd be interested, wouldn't you?

Well, all the above are facts which we will gladly prove.

The Goodale Co.

Matchplates Exclusively

KALAMAZOO, : MICHIGAN

TALC

FOUNDRY FACINGS

Can be used for many purposes instead of lead facings, and at a great saving. Investigate.

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THE COHUTTA TALC CO.

SAWED CRAYONS **TALC** FOUNDRY FACING

DALTON, GEORGIA

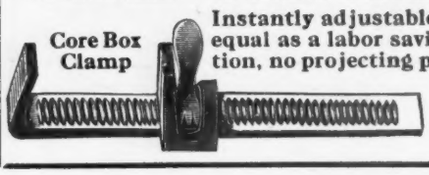
MOLDING MACHINES—AIR COMPRESSORS—PNEUMATIC HOISTS
CRANES—EXHAUST TUMBLING BARRELS
SAND MIXERS

Representing { The Berkshire Mfg. Co. / Curtis & Co. Mfg. Co. / Standard Sand & Machine Co.

WM. H. NICHOLLS, Foundry Equipment, 30 Church St., New York City

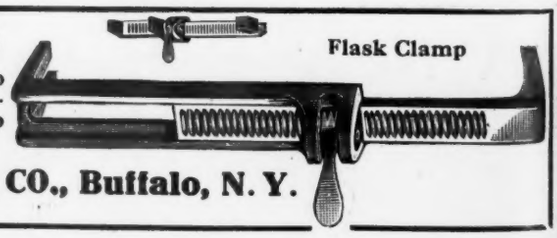
JOSEF UNIVERSAL CLAMPS

Core Box Clamp



Instantly adjustable to any flask. They have no equal as a labor saving device. Simple construction, no projecting parts, strong, light and cheap

Flask Clamp



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OXYGEN GAS - OXYGEN AND ACETYLENE SPECIALTIES

OXY-ACETYLENE WELDING AND EQUIPMENTS

Office, 430 Perry Bldg., Phila., Pa. Works, Camden, N. J.

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LEARN HOW TO USE THEM

I want to teach every foundryman to mix irons by analysis, my original method of making Semi Steel using from 30 per cent to

50 PER CENT STEEL SCRAP IN THE MIXTURE

cupola practice, chill castings, and good foundry advice gathered by me in 35 years' practical experience which I have arranged in

SIX EASY LESSONS

in pamphlet form. No large textbooks. The lessons contain many blunt facts, money savers to every molder, foreman, superintendent and owner. You do not waste your valuable time nor lose sleep studying, for I have done all the experimenting.

YOU REAP THE BENEFIT

Under date of April 26th, Mr. Elmer Cordrey states:

Milwaukee Correspondence Schools,
David McLain, Manager.

Dear Sir:—We are getting quite a few new customers for no other reason than the Semi-Steel.

Gears that weigh as much as 4000 pounds that were formerly *made of steel* are now being made by us of Semi-Steel under specifications that require 40,000 pounds tensile strength.

We are getting tons of work from a drop forging concern for their dies that were made of steel before. Our dies are giving A-1 satisfaction. All credit to you.

Write for full particulars

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803 Goldsmith Bldg. **DAVID McLAIN, Manager** **Milwaukee, Wis.**

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THE CLEVELAND CRANE & ENGINEERING CO
WICKLIFFE, O.

Are You Contented

to be a small **Man** with a small **Job** and a **Small SALARY?**

If not, and you want to fit yourself for something better, read the following list, check the position you want to qualify for, mail to us **TO-DAY** and receive by return mail **FREE** information **How to Do It.**

Cost Accountant	Factory Systems Expert
Cost Clerk	Factory Production Clerk
Office Manager	Factory Transfer Clerk
Factory Manager	Supt. of Manufacturing
Foundry Manager	Foreman of Manufacturing
Expert Foundry Clerk	Production Engineer
Expert Time Clerk	Plant Construction Engineer
Mechanical Draftsman	Mechanical Engineer

Modern Systems Correspondence Schools
6 BEACON STREET, BOSTON, MASS.
OSCAR E. PERRIGO, Prest. and Director

OTIS STEEL

"Otis" Fire Box Plates a Specialty

FLANGE PLATES, SHIP PLATES, TANK PLATES, STEEL CAR AXLES AND FORGINGS OF ALL KINDS

Steel Castings from 100 to 100,000 lb.

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DETROIT, George W. House, Ford Building.
SAN FRANCISCO, John Woodlock, 154-156 First St.

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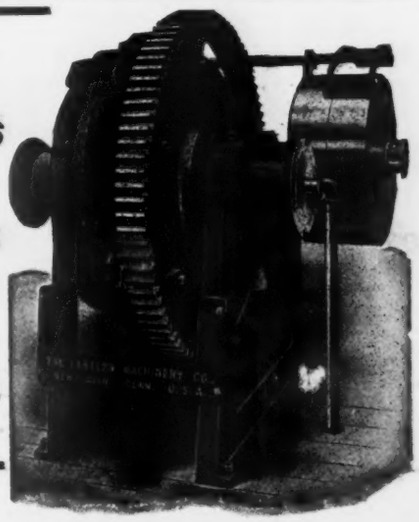
Hill Improved Cinder Crushers

THE BEST PULVERIZERS
FOR BRASS FOUNDRY CINDERS
AND SIMILAR MATERIAL

The Eastern Machinery Co.
NEW HAVEN, CONN.



Damascus Bronze Company

PITTSBURG, PA.

WE ARE THE LARGEST MANUFACTURERS OF

PHOSPHORIZED COPPER

IN THE WORLD

Castings For All Purposes

WIRE
For Springs and General Purposes.

ELEPHANT BRAND

DELTA
REG. U.S. PAT. OFF.

THE PHOSPHOR BRONZE SMELTING CO.
2200 WASHINGTON AVENUE, PHILADELPHIA, PA.
ELEPHANT BRAND "Phosphor-Bronze"
INGOTS, CASTINGS, WIRE, SHEETS, RODS, Etc.
—DELTA METAL—
IN BARS FOR FORGING AND FINISHED RODS
ORIGINAL AND SOLE MAKERS IN THE U. S.

BINDING WIRE
For Electrical Purposes.

Rods for Bushings, Pinions, Pumps, Etc. Sheets for Springs, Valves, Stampings, Etc.

TRADE MARK.
LION BRAND ALLOYS & METALS

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MANUFACTURERS, METALLURGISTS, MINE OWNERS, MERCHANTS
Founded 1869 by Geo. G. Blackwell

HEADQUARTERS FOR **Ferro Alloys, Metals and Ores** *WRITE FOR PAMPHLETS*

METALLURGICAL WORKS: GARSTON, ENGLAND. U. S. AGENTS—FLUOR SPAR—THE PENN SALT MFG. CO., PITTSBURGH, PA.

ALL FOUNDRY REQUISITES

WE MAKE, and our PAMPHLETS fully describe the uses of . . . . . FERRO { CHROME, TUNGSTEN, MOLYBDENUM, SILICON, BORON, VANADIUM, TANTALUM }

TUNGSTEN METAL, 96-99 per cent.
CHROMIUM METAL. Carbonless.
S. A. M. ALLOY. Produces Sound Ingots and Castings free from Blowholes.
SPECIAL HIGH SPEED ALLOY for Tool Steel.
ALLOYS and METALS for every purpose required.

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CHROME ORE—Special Refractory for Furnace Linings.
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C. W. LEAVITT & CO.,
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ORES and METALS
ALSO AGENTS FOR
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ELECTRIC FURNACES,
Carbon Electrodes
—AND—
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HYDROFLUORIC ACID
For Cleaning Castings
Dissolves the sand: no loss of metal
Replaces the Tumbling Barrel
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Analysis, Assays, Sampling
Reliable work at moderate rates

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NOW THE RECOGNIZED STANDARD

The Fact that the United States Government has awarded us a contract for 600,000 lbs.—the largest order ever placed—is sufficient evidence of the character of our product.

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HIGH GRADE

50%, 75%, 95%,

We solicit your inquiries when in the market, both for spot and to arrive.

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LININGS
are made with
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and
"U" BRAND
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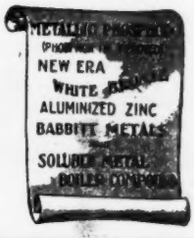

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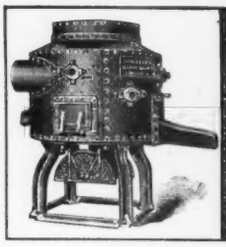

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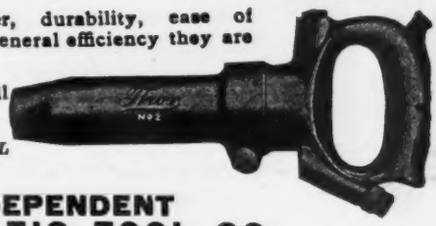
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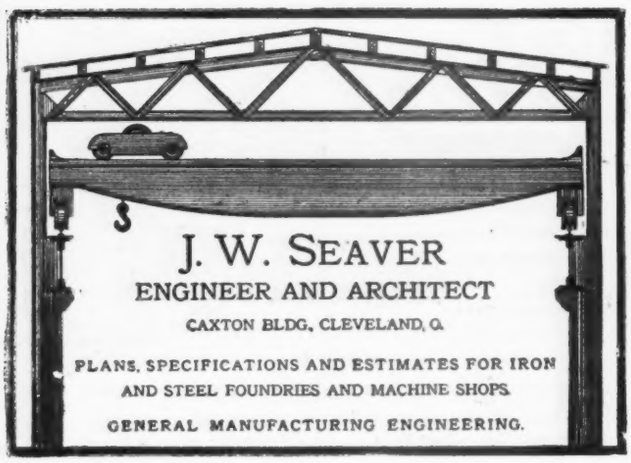

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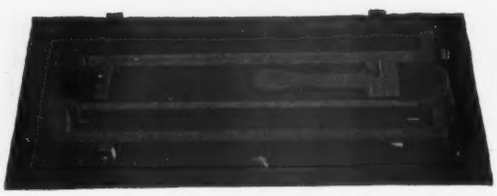

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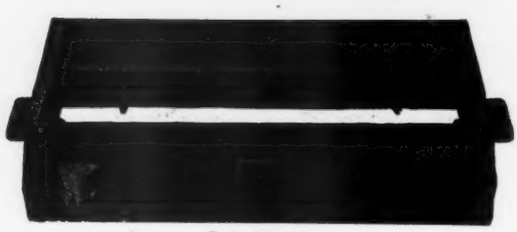

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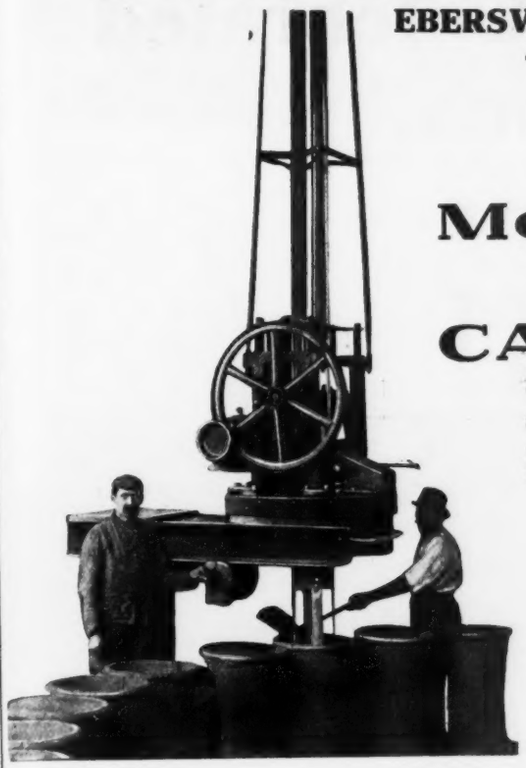

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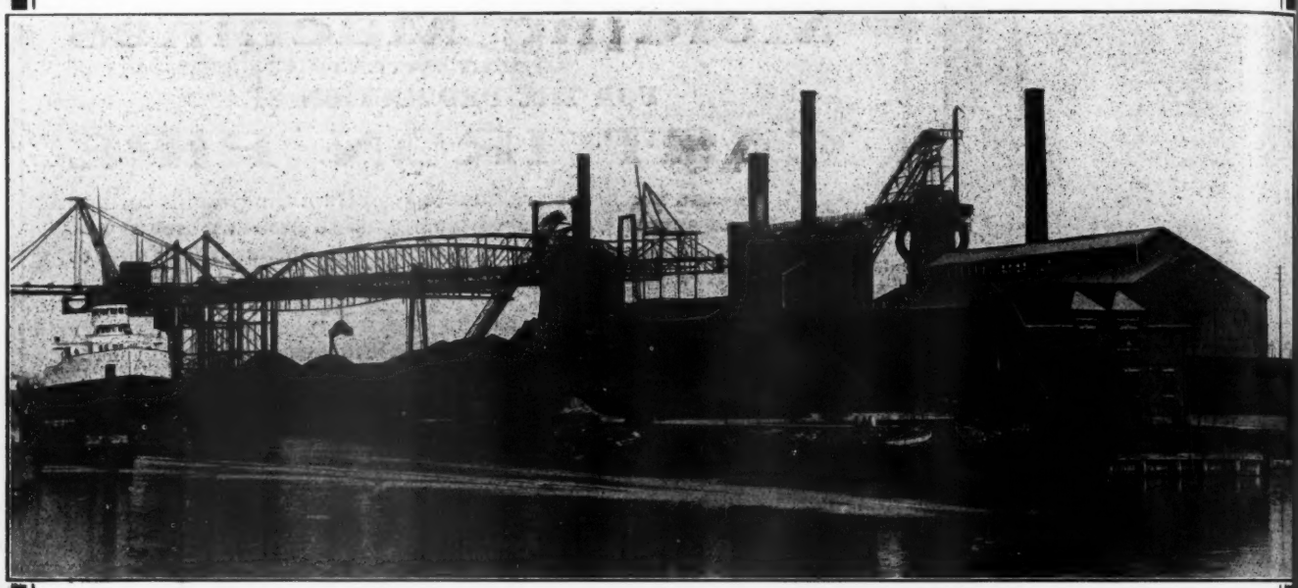

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SULPHUR, .58 **ASH, 7.14**

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It is guaranteed to run approximately true to analysis—chemical as well as physical. You can try it without risk, for we make you an all-to-win and nothing-to-lose proposition.

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AVERAGES

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on page 146 this issue.

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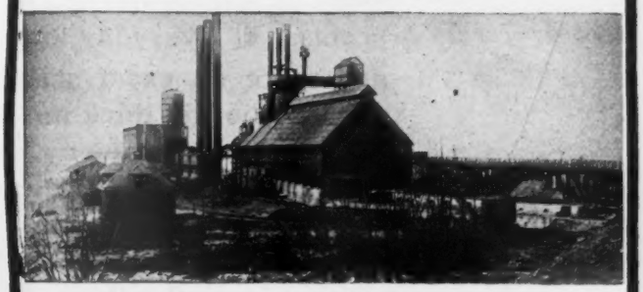

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